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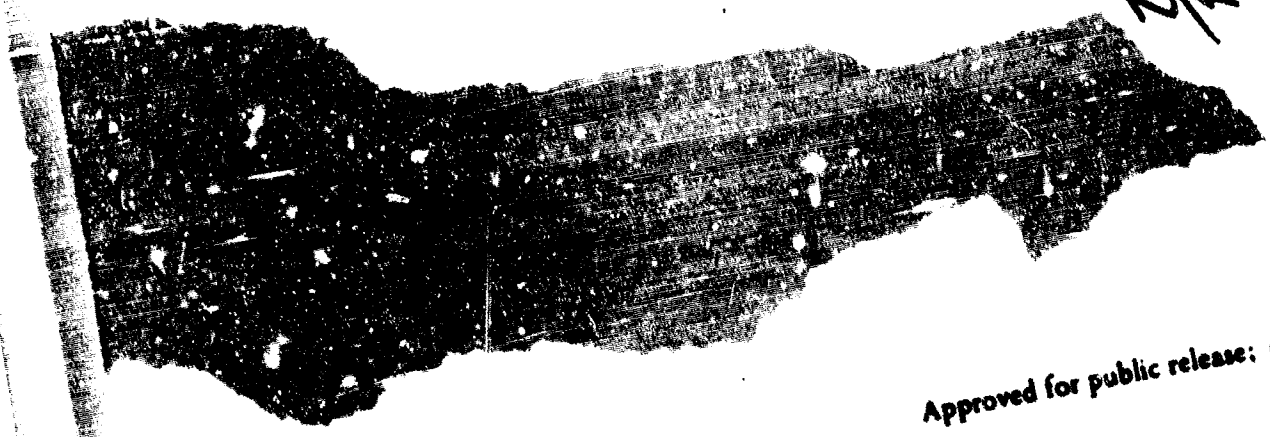

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NOTICE

The following definitions apply for the transliterated organizational entities included in the text:

chast'	[voinskaya chast'] - Administrative, line, and supply unit (yedinitsa) of the [branches] of troops, which has a number and banner, e.g., a regiment, separate battalion (batal'on, division) and troop organizations equal to them.
ob''yedineniye	[operativnoye ob''yedineniye] - Large-scale unification of various soyedineniye of the branches of troops, which is nonpermanent in composition and is intended to conduct operations in a war.
podrazdeleniye	Troop unit of permanent organization and homogeneous composition in each branch of troops, which unit forms a larger podrazdeleniye or a chast'.
soyedineniye	[soyedineniye voyskovoye] -- Combination (soyedineniye) of several chast' of one or various branches of troops into a permanent organization (division, brigade, or corps), headed by a command and a staff and including chast' and podrazdeleniye of auxiliary troops and services necessary for combat operations.
Source:	Russian-English Dictionary of Operational, Tactical and General Military Terms, 1958

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ON TO NEW ACCOMPLISHMENTS

Editorial

Our people entered the 55th year of the Great October Revolution with a feeling of revolutionary optimism and filled with strength and energy. Looking back at the path they have traveled, they find pride in the fact that they were first in the history of mankind to build a developed socialist society under the leadership of their fighting vanguard -- the Lenin Party. The country of Soviets now possesses a powerful industrial might and large-scale, mechanized agriculture. It has achieved remarkable success in all fields of scientific-technological progress. The sociopolitical and ideological unity of all classes and social groups, nations and nationalities, has been forged in the struggle for socialism and communism. A new, historic community of people has arisen -- the Soviet people, and a new, socialist way of life has become firmly established.

Supported by the decisive advantages of socialism and the immeasurably increased possibilities of the Soviet economy, the Communist Party at its 24th Congress determined the tasks of the ninth five-year plan, fulfillment of which will be a major step toward achieving the goals of the present stage in the building of communism. We must ensure a considerable rise in the material and cultural level of living of the people on the basis of high rates of development of socialist production, increases in its effectiveness, scientific-technological progress, and acceleration of the growth of labor productivity. As the Party Congress stressed, this course determines not only the main task of the upcoming five-year period, but also the general orientation of the country's economic development toward a long-term perspective.

The ninth five-year plan provides for high tempos and proportional development in all branches of the national economy, an increase in the national income, improved distribution of productive forces, development of the economies of the union republics, and rapid development of the natural resources of the country's eastern regions. The structural changes in industrial production which will occur in connection with higher tempos of development of branches which put out consumer goods do not signify a decrease in the Party's attention for heavy industry, which is the basis of expanded

socialist reproduction, technical recutfitting of the national economy, strengthening of the defensive capability of the Soviet State, and increases in the welfare of the people.

The Soviet people have perceived the grandiose program of socioeconomic development of the country outlined by the 24th CPSU Congress to be their own vital cause. This is borne out by the confident start of the five-year period. According to preliminary figures, this year will see over 120 million tons of steel smelted, i.e., we are coming right up to the level of the USA. There will be 370 million tons of oil and over 210 billion cubic meters of natural gas obtained, and around 800 billion kilowatt-hours of electrical power will be developed. The agricultural workers are also laboring selflessly. In spite of unfavorable climatic conditions in a number of areas of the country, there has been a good harvest of grain, cotton, and other crops. USSR State Prizes have been awarded in 1971 for outstanding successes in natural science and technology, in literature and art. The results achieved show convincingly that the annual economic plan will be successful. Thus, firm bases have been laid for realizing the assignments of the entire five-year plan.

The Communist Party ties in all its plans with development of creative initiative on the part of the popular masses, and with their participation in solution of political and economic problems. As L. I. Brezhnev stated in the CPSU CC Report to the 24th Congress, "Our economic program must be supported by broad party-organizational, political, and ideological-educational work which is capable of fully activating those gigantic forces which are fundamental to the socialist order and the Soviet citizen -- the bearer of remarkable qualities of fighter, laborer, creator." This is the direction of decrees recently passed by the CPSU CC on improving the organization of socialist competition, the economic formation of workers, and the work of communist labor schools.

Success in creative labor and a steady rise in economic and defensive might of the socialist Motherland have a direct relationship to the strengthening of its position on the international scene and to the success of our foreign policy. Guided by Lenin's foreign policy course, the 24th CPSU Congress developed a thoroughly grounded program of struggle for a firm peace and collective security, for collaboration and mutual understanding among countries, and for the freedom and independence of peoples. In the foreign policy of the Soviet State the firm rebuff to imperialist aggression is combined with a logical insistence on the principle of peaceful coexistence of states with different social orders.

The Leninist peace-loving nature of the foreign policy of the USSR enjoys the fervent sympathy of many millions. The results of visits by Soviet party and state leaders to various countries of four continents received the broad support of world public opinion. An act of major international importance was Brezhnev's visit to France. His activities during this visit were fully approved by the Politburo of the CPSU CC, the Presidium of the USSR Supreme Soviet, the USSR Council of Ministers, and by the entire

Party and people. Now and in the future, the Soviet Union will be decisively for strengthening the unity of the socialist countries, for rallying the forces of the international working class and of national liberation, for the peace and security of peoples, and for creation of peaceful conditions for the building of socialism and communism.

Events in the world arena indicate that aggressive forces of imperialism have not given up attempts to turn back the clock of history, nor have they rejected expansionistic and adventuristic schemes. They are waging a criminal war in Indochina, they encourage the predatory drive of Israeli extremists, and oppose the planned relaxation of tension in Europe and a warming of the entire international climate. World imperialism, and above all US imperialism, continues to build up means of attack directed at the Soviet Union and other countries of the socialist commonwealth.

In defending the cause of peace, our Party, which knows well the perfidy of the imperialist aggressor, devotes unremitting attention to strengthening the defensive capability of the Soviet State and raising the combat might of the USSR Armed Forces. L. I. Brezhnev said in the CPSU CC Report to the 24th Congress, "Everything created by the people must be reliably defended. Strengthening the Soviet State means strengthening its ARMED FORCES [sic] as well, and increasing in every way the defensive capability of our Motherland. While we live in a troubled world, this task remains one of the most important ones!" Today the technical outfitting of our Armed Forces is far from what it was near the end of the Great Patriotic War. Thanks to the Party and the labor of the Soviet people, the Army and Navy have completely modern combat equipment.

The Soviet Armed Forces represent a mighty, united collective of steadfast and courageous soldiers, devoted to the ideals of communism and ready at any minute to come to the defense of the historic achievements of the Great October. Motivated by this noble and lofty feeling, they master their combat equipment assiduously and persistently and fulfill their patriotic duty honestly and conscientiously. Results of the past training year show that the pledges made in the socialist competition in honor of the 24th CPSU Congress have been fulfilled. This means that the soldiers reached new heights in their combat improvement and filled out the ranks of rated specialists and genuine masters of military affairs.

The Communist Party teaches us not to rest on our laurels. In the new training year which has begun Soviet soldiers have actively joined the socialist competition in honor of the 50th anniversary of the Union of Soviet Socialist Republics. They are accomplishing even broader and more complex tasks of further increasing the combat readiness of chasti and ships, and are persistently mastering everything new which is providing for rapid scientific-technological progress. True sons of their Motherland, our soldiers again assure the Communist Party and the people that they will always vigilantly watch the intrigues of the imperialist aggressors, and together with their comrades in arms -- soldiers of armies of the fraternal socialist countries -- they will reliably defend the cause of peace and socialism.

THE GREAT BATTLE

Talk with Mar SU A. M. Vasilevskiy

Three decades have passed since that gigantic battle unfolded on the fields before Moscow. It has entered the annals of the Great Patriotic War as a most vivid page written in gold. It was where the fundamental turning point began in the armed conflict to the benefit of the Soviet Union.

The main body of the fascist German army was massed on the approaches to Moscow. The capital of our Motherland became an invincible fortress. Bristling with belts of defensive fortifications, Moscow worked and forged victory. Remaining here at their combat posts were the Politburo of the Party CC, the State Defense Committee, the Government, and the General Headquarters of the Supreme Command.

Having worn down the enemy hordes in heavy defensive battles, Soviet soldiers threw them from the walls of the capital and drove them to the west. The plan for a Blitzkrieg against the Soviet Union was buried once and for all. The insolvent strategy of the fascist Wehrmacht was laid out for all to see.

The historic victory at Moscow inspired Soviet people on to new deeds and strengthened their confidence that the enemy would be inevitably smashed. This is how it happened. Mar SU and Twice Hero SU A. M. Vasilevskiy, who at that time was Chief of the Operations Staff and Deputy Chief of the General Staff of the Red Army, tells about the main stages of the battle.

Could you briefly tell of the situation which preceded the Battle of Moscow, and remind the readers of the ratio of forces and weapons?

At that menacing time the situation was very difficult and complex. The enemy had the opportunity to wedge deeply into our country because of

temporary advantages such as total militarization of the German economy, a multimillion-man army with combat experience mobilized ahead of time, and the utilization for aggression of the armed forces of satellite states, stockpiles of strategic raw materials, and the military industrial enterprises of almost the entire continental portion of Western Europe. The factor of surprise was on the side of the fascists, who committed an insidious and treacherous attack. We lost the Baltic, Belorussia, Moldavia, the greater part of the Ukraine, and a number of oblasts of the Russian Federation. Loss of such a vast territory involved a considerable reduction of supplies and food resources. Millions of Soviet people were left under the heel of fascist monsters.

The vast scope of armed conflict on the Soviet-German Front showed that it was here that the outcome of World War II was being decided. This must be said again, since bourgeois historians continue to assert that in 1941 "decisive" operations were being waged in North Africa, and that the British had diverted many forces and weapons of the common enemy there. As a matter of fact, there were only three German and seven Italian divisions there in 1941.

The Soviet Army was forced to withdraw, but withdrawal was invariably accompanied by its heroic struggle for each inch of native soil. "Hold out and win!" These words entered the consciousness of Soviet soldiers as firmly as an unbreakable vow. They expressed an unflinching resolve to drain the hated occupiers of blood and destroy them. The occupiers suffered considerable losses as early as the border clashes and in the legendary defense of Leningrad, Kiev, and Odessa. Remember the Battle of Smolensk, the results of which are difficult to overestimate. During this battle, which lasted two months, Soviet forces smashed several crack enemy divisions and disrupted calculations for an unopposed movement to Moscow and a simultaneous attack along other strategic axes. At Smolensk the doctrine of Blitzkrieg ballyhooed by Nazi propagandists received its first serious chink. Having forced the fascist invaders to take up the defense there, we won valuable time for readying reserves, who played a great part in subsequent events on the Soviet-German Front.

Although the enemy's summer offensive against Moscow failed, the danger had not lessened. As before, seizure of the Soviet capital remained his main goal, and with its attainment he saw a victorious end to the war before the onset of winter. "An offensive against Moscow promises the greatest chances of success in the operation," General Halder, Chief of the Ground Forces General Staff wrote in his official diary. "With a blow at Moscow we will strike the head and heart of the Soviet system," Field Marshal Kluge echoed.

The Hitlerite military leaders gave a high-sounding name to the new operation to capture Moscow -- Typhoon. Reveling in their temporary successes, they were convinced that the operation would unfold without pauses, as swiftly as a hurricane of colossal destructive force. The concept of the operation was to dismember the defense and surround and destroy our forces in the vicinities of Vyaz'ma and Bryansk, subsequently to continue a frontal attack on Moscow, taking it simultaneously from the north and south.

Realization of this concept was placed in the hands of Army Group Center. The latter comprised 77 divisions, including 14 Panzer and 8 motorized (over a million men, 1,700 tanks, over 14,000 guns and mortars, and 950 aircraft). In other words, opposite the Soviet capital the enemy had massed over two-fifths of all his forces, three-fourths of his tanks, almost half of his guns and mortars, and around a third of the aircraft operating on the Soviet-German Front. It should be particularly stressed that this high degree of motorization made it possible for him to rapidly maneuver from the depth and along the front.

The Soviet forces (Western Front under Col Gen I. S. Konev, Bryansk Front under Col Gen A. I. Yeremenko, and Reserve Front under Mar SU S. M. Budennyy) comprised 95 divisions, of which three were motorized rifle, nine were cavalry, and thirteen were tank brigades. There were around 800,000 men, 782 tanks (of which 641 were light tanks, inferior in performance to the German tanks), 6808 guns and mortars, and 545 aircraft -- the majority of which were outmoded designs -- in the three fronts. The troops mainly used horse traction to maneuver men and weapons.

The attention of all mankind was fixed on Moscow in those days. This is understandable. Moscow personified the first socialist state of workers and peasants in the world to rise up in sacred battle against fascism -- the shock force of anticommunism. The eyes of all Soviet citizens were on Moscow. They were gripped with a fervent desire no matter what to keep the enemy from its streets and squares, washed with the blood of heroes of three revolutions. Soviet citizens rallied even closer around the Communist Party, which became a fighting party in the first days of the war. They believed implicitly in its slogan: Our cause is just. The enemy will be smashed. We will be victorious.

We know that the defensive period of the battle was the most critical for our troops. What steps were undertaken to halt the enemy's advance?

Without dwelling on a detailed analysis of the battle -- I think it is thoroughly covered in special research and memoirs -- it should first be noted that its initial stage was bad for us. In the first ten days of October forces of the Western and Reserve fronts suffered substantial losses in personnel and combat equipment. Four armies fell into encirclement west of Vyaz'ma. The Bryansk Front was experiencing no less difficult a situation. Although its armies succeeded in breaking out of encirclement, they also had to experience the bitterness of heavy losses.

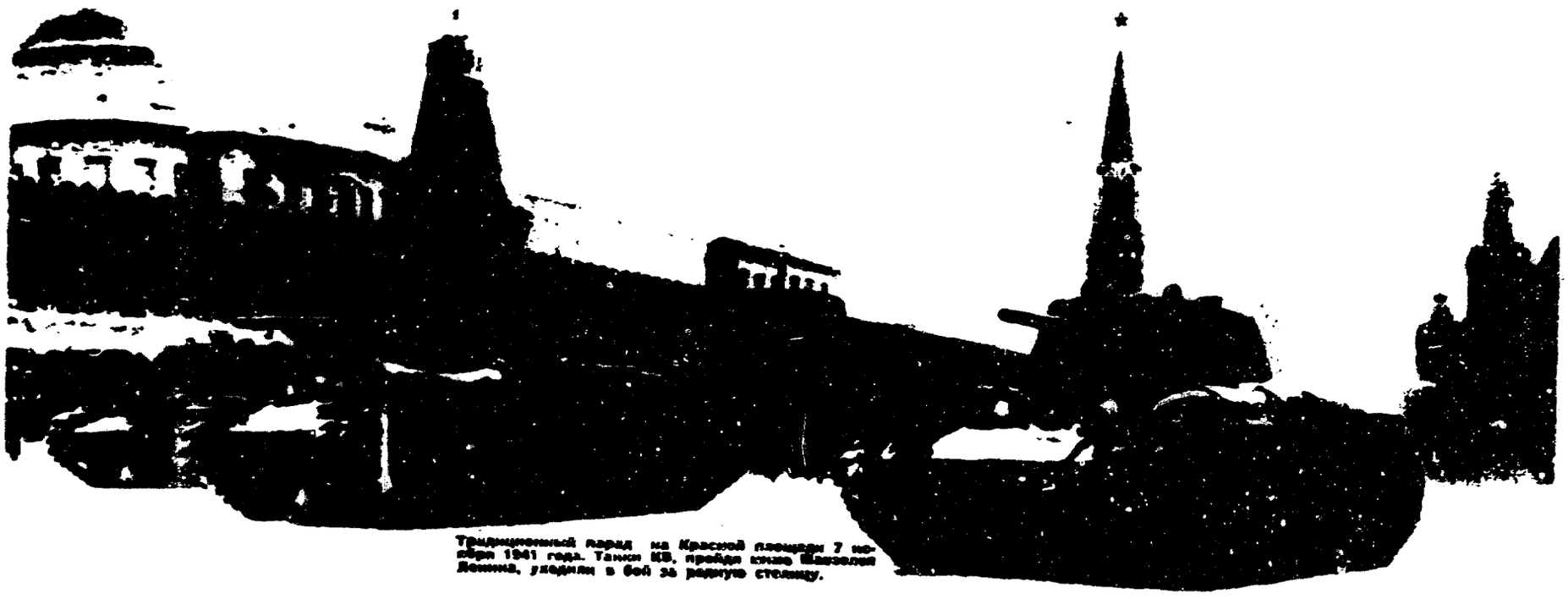
It must be said that in addition to reasons of an objective nature, the organization of our defense left much to be desired, especially regarding antitank defense. The situation was more complicated by the fact that at the moment the enemy broke through our defense, we had still not enough reserves in the immediate vicinity of Moscow to reliably cover it. Available reserves were expended to reinforce the Western and Bryansk fronts, to create a defense in the rear of the Western Front and Vyaz'ma line, and also in connection with what were for us very unfavorable events on the Southwest Front at Kiev.

Taking advantage of a superiority in men and weapons, especially tanks, the enemy continued to rush forward. It was completely obvious that such a development of events indicated extraordinary measures to halt or weaken the enemy onslaught.

On the night of 4/5 October the State Defense Committee made the decision to make the Moshaysk line of defense the main line of resistance. Immediately there began a move to that area of 11 rifle divisions, 16 tank brigades, and over 40 artillery regiments from the reserve of the Supreme Command GHQ and from other fronts.

The Supreme Command GHQ ordered the 1st Guards Rifle Corps formed and hastily moved to the vicinity of Mtsensk with the mission of preventing the enemy from bypassing Moscow from the southwest. The Corps included two tank brigades. Here Soviet soldiers offered stubborn resistance to the fascist invaders, something which the Hitlerite military leaders had not expected at all. This became known from the diary of this same Halder. On 4 October he wrote: "Operation 'Typhoon' is developing almost classically." However on 6 October he stated, not without regret: "The Second Panzer Army of Guderian attacking from Orel to Tula received a heavy enemy counterattack." A mood of despair replaced even Guderian's optimism. In memoirs published after the war, he wrote that as a result of enormous losses suffered by his army at Mtsensk, "prospects were lost for a rapid and continuous success."

In order to use men and weapons with greatest effect to repulse the enemy, the State Defense Committee decided on 10 October to unite forces of the Western and Reserve fronts into a unified Western Front and subordinate to it the <u>soyedineniye</u> and <u>chasti</u> which were arriving at the Moshaysk line.



Традиционный парад на Красной площади 7 ноября 1941 года. Танки КВ, прибыв прямо [illegible] Ленина, уходили в бой за родную столицу.

Traditional parade on Red Square on 7 November 1941. The KV /Klim Voroshilov/ tanks passed by the Lenin Mausoleum on their way to do battle for the native capital.

Army Gen G. K. Zhukov was assigned as Commander-in-Chief of this Front. On that very same day a session of the State Defense Committee again reviewed the problems connected with the defense of Moscow. With the aim of strengthening the near approaches to the capital, a decision was made to construct a third defensive line in its immediate vicinity -- the Moscow Defense Zone.

In the mind of every Moscow defender there lived then one thought which spurred them to energetic action and called them to perform heroic exploits -- the thought of winning time in order to strengthen defenses in every possible way. Those of our soldiers who were encircled west of Vyaz'ma fought with the very same thought. During the week of 7 through 14 October they displayed amazing steadfastness, boundless courage, and daring bravery in drawing upon themselves from 28 to 14 hostile divisions. Meanwhile, on the fields near Moscow the combat engineer work was expanding continuously, the defense was taking on depth, and the basic avenues of approach were covered by reserves. After the exceedingly fierce battles at Vyaz'ma a considerable part of our forces broke out of encirclement and flowed into the ranks of the capital's defenders. But many soldiers perished. Today, in marking the 30th anniversary of the great battle, we the living are obligated to render them the tribute of deepest gratitude. They have made an inestimable contribution to the attainment of victory.

By the middle of October on the Western Front, opposite which the basic enemy grouping was operating, the troops' efforts were concentrated on covering such axes as the Volokolamsk (newly formed Sixteenth Army commanded by Lt Gen K. K. Rokossovskiy), Moshaysk (Fifth Army, command of which was assumed by Maj Gen Arty L. A. Govorov after Maj Gen D. D. Lelyushenko was wounded), Maloyaroslavets (Forty-Third Army, commanded by Maj Gen K. D. Golubev), and Kaluga (Forty-Ninth Army, commanded by Lt Gen I. G. Zakharkin). Somewhat later, troops of Thirty-Third Army, commanded by Lt Gen M. G. Yefremov, were moved to the Naro-Fominsk Axis.

In these days the enemy undertook a powerful offensive on the right wing of the Western Front, northwest of Moscow, and on 14 October burst into Kalinin. In order to hinder his further advance on this axis, the GHQ of the Supreme Command formed a new front, the Kalinin Front, headed by Col Gen I. S. Konev. It included the Twenty-Second, Twenty-Ninth, Thirty-First, and Thirtieth armies of the right wing of the Western Front, which had been operating here. The stubborn defense of troops of the Kalinin Front halted the enemy and the troops took up a favorable operational position in relation to the enemy's northern grouping, which was attacking Moscow.

In the latter half of October there were fierce battles on all the aforementioned axes which did not abate either day or night. The danger hanging over the Soviet capital grew. The Party Central Committee and the State Defense Committee decided to evacuate certain governmental institutions and the diplomatic corps. A state of siege was introduced as of 20 October in Moscow and its adjoining regions. This important measure helped increase the efficiency of the defense and raised still higher the soldiers' and Muscovites' sense of responsibility for the fate of the capital.

1941. Aerial bombs are readied for the front.

It is impossible to characterize in a few words the enormous work done in those tense days by the Moscow Party organization. The meeting on 13 October of the Moscow Party aktiv expressed the conviction that workers of the capital would all rise like one to the struggle against the fascist invaders. That is how it was. In spite of firing and bombing, hundreds of thousands of Muscovites erected defensive structures, while those who remained in factory shops labored tirelessly to manufacture weapons and return damaged equipment to operation. To this must be added that even in the first half of October, Moscow placed almost a fifty-thousand-man army as supplementary help to the front.

Moscow defended itself selflessly not only from the ground, but from the air as well. Measures taken by the State Defense Committee and the GHQ of the Supreme Command directed toward strengthening the capital's air defenses, and also the great work done by Party organizations to prepare Muscovites for the struggle against the air enemy, sharply heightened the mobilization readiness to repulse an air attack. Thanks to a well thought out air defense system and the combat skill and bravery of its soldiers, Moscow was saved from major destruction.

Throughout October, Soviet soldiers repulsed massive enemy attacks, relying on the powerful support of the people and sparing neither blood nor life itself. And although by the end of the month the enemy had succeeded in advancing 230-250 kilometers, he had not attained his goal. His advance was halted on the line Turginovo, Volokolamsk, Dorokhovo, Naro-Fominsk, west of Serpukhov, Aleksin. His attempts to capture Tula were also in vain. There the men of Fiftieth Army together with armed detachments of Tula workers fought valorously.

The moral-political uplift of the defenders of Moscow and of all the Soviet people was enormously aided by the grand session dedicated to the 24th anniversary of the Great October and the traditional parade of troops on Red Square. In the report at the session and the speech at the parade delivered by I. V. Stalin on behalf of the Central Committee of the Communist Party there resounded the inflexible resolve of the Soviet Union to defend its capital and complete confidence in victory of our just cause. Soviet soldiers left for forward positions right from Red Square.

The enemy still possessed considerable power and therefore had not given up hope for capture of Moscow at any cost. Our troops, too, readied themselves for repulsing a new onslaught. In the first half of November there was an increase in numbers of aircraft, tanks, and artillery, including rocket-propelled. A major undertaking of the GHQ of the Supreme Command at that time was completion of preparations for new reserve formations. We, the heads of the General Staff, were given the duty of including in reports to the GHQ on the situation at the fronts the course of formation of these armies in detail.

Party-political work was performed under the motto: "We will defend our native Moscow! At Moscow must begin the rout of the fascist German invaders!" The ranks of Lenin's party increased. The troops fighting at Moscow by the beginning of November included over 120,000 Party members -- almost 10 percent of all Army Party members.

The Hitlerite military leaders renewed the attack on 15-16 November. With two powerful groupings consisting primarily of armored vehicles, the enemy intended to detour Moscow from the north via Klin and Solnechnogorsk, and from the south via Tula and Kashira. The fields of Moscow again became the arena of bloody fighting. Soviet soldiers stood to the death. Mass heroism was a common phenomenon. The words of Guardsmen from Dubosekovo Station, which have become the property of history, were repeated in those days by thousands of glorious fighters of the Western Front a countless number of times: "Great is Russia, but there is nowhere to go behind Moscow."

At the cost of enormous losses, the enemy succeeded by the end of November to move northeast of the capital to the Moscow-Volga Canal and to force it at Yakhroma, and to the southeast he reached the vicinity of Kashira. This was the end of his advance. He turned out to be in no condition to move further. During the second stage of his assault on Moscow, he lost 155,000 killed and wounded, around 800 tanks, up to 300 guns and mortars, and around 1,500 aircraft.

Thus ended the defensive period of the Battle of Moscow.

How do you evaluate the counteroffensive undertaken by our forces at Moscow and its results?

The idea of a counteroffensive arose at the beginning of November, when the first enemy attempt to take the Soviet capital was disrupted, but it had to be discarded due to a new assault which all available reserves were needed to repulse. Only at the end of November, when the enemy had exhausted his offensive capabilities, his shock groupings were extended along a broad front, and he had not managed to dig in on the positions he had reached, did the GHQ return to the idea of a counteroffensive. By this time operational ob"yedineniya were arriving one after another to the Moscow area to replenish troops of the Western Axis.

Although the overall numerical and technical superiority remained as before on the side of the enemy, we succeeded in creating the necessary groupings capable of finally preventing his attack on Moscow, and in not only saving the capital, but in laying the beginning to the fundamental turning point in the course of the war. Confidence in this was also based on the high morale and the increased combat mastery of our soldiers.

The concept of the counteroffensive was that troops of the right and left wing of the Western Front in coordinated action with the Kalinin and Southwest fronts would strike to route the enemy groupings seeking to envelop Moscow from the north and south. It was self-evident that success in the matter was decided by careful preparation. Credit must be given to the commanders of fronts and armies and to their staffs -- they handled this very complex task.

Success of the counteroffensive, especially northwest and southwest of Moscow, built up with each passing day. The initiative swung to the Soviet troops, and this made a stunning impression on the Hitlerite military leaders. Still very recently the German propaganda was persistently asserting: "Our attack on Moscow has gone so far that we can already see the inner part of the city through good binoculars." Moreover, the Berlin press received instructions to leave space on 2 December for publishing reports about the fall of the "capital of Bolsheviks." Now however everything had fallen apart... The Hitlerite military leaders had reason for finding themselves in a state of shock.

Already on 16 December troops of the Kalinin Front had liberated Kalinin, and on 7 January 1942 they approached the Volga at Rshev. Troops of the right wing of the Western Front by 25 December hadadvanced a distance of up to 100 kilometers and moved to the line of the rivers Lama and Ruza. Troops of the left wing of this front had thrown the enemy 130 kilometers back by 17 December. At the same time, troops of the right wing of the Southwestern Front advanced 80-100 kilometers in the vicinity of Yelets. The newly formed Bryansk Front, exploiting the success of the Western Front, developed the attack on the Orel Axis and by the end of December had advanced up to 110 kilometers to the Oka River line. At the beginning of January, troops of the center of the Western Front moved forward and reached the line Naro-Fominsk, Maloyaroslavets, west of Kaluga, Sukhinichi, Belev.

January of 1942 was marked by the move of the Soviet Army into a general offensive, in which nine fronts participated, aided by naval forces.

On the northwest axis our forces struck blows against the enemy grouping which had blockaded Leningrad, surrounded several of his divisions in the vicinity of Demyansk, and waged battle at Staraya Russa. On the central axis combat operations developed in the areas of Rzhev, Gzhatsk, and Vyaz'ma. On the southwest axis there was fighting in the areas of Orel, Khar'kov, Dnepropetrovsk, and on the Kerch' Peninsula.

In the course of the general offensive, which continued through April of 1942, Soviet forces liberated from the occupiers completely Moskovskaya, Tul'skaya, and Ryazanskaya oblasts, and partially liberated Leningradskaya, Kalininskaya, Smolenskaya, Orlovskaya, Kurskaya, Khar'kovskaya, and Stalingradskaya oblasts and the Kerch' Peninsula. In connection with a lack of men and equipment we did not succeed in concluding the general offensive on all three axes with a total rout of the enemy. Nevertheless, during this time he was deprived of many of his best divisions and suffered considerable losses in combat equipment.

Since the war's beginning losses of German ground forces comprised over 1.1 million men -- almost a third of their initial strength.

With the great victory on the fields of Moscow won by the Soviet people and its army under the inspiring leadership of Lenin's Party, there began a fundamental turning-point in the course of the World War II. It became even more obvious that calculations of the Hitler clique to crush the Soviet State were unrealizable, that its military machine which had rolled in triumphal march through the countries of Europe had received an irreparable break, and that the strategy of Blitzkrieg was bankrupt. Not having attained its goal -- "to crush Soviet Russia in a brief campaign," as prescribed by Plan Barbarossa -- Germany faced the prospects of waging a long drawn out, exhausting war.

The victory at Moscow helped increase the scope of the liberation movement in countries which had fallen under the yoke of Nazi occupation, and visibly showed the peoples of all the world that on the side of socialism was not only right, but a mighty force, and that fascism was doomed to inevitable defeat.

The rout of fascist German troops on the fields of Moscow had an effect on sharpening the contradictions between Hitler Germany and its satellites, and on the growth of antiwar sentiment in countries of the fascist coalition.

The victory at Moscow considerably weakened the threat of Japan's entry into the war against the Soviet Union. This victory had a sobering effect on the aggressive circles in Turkey. An end was put to the attempts by the Hitlerites to spread their influence to Iran and use its territory as a base of operations against our country.

The victory at Moscow was prepared by the tireless political and organizational activity of the Communist Party. It seemed to many in the West that the Soviet Union was in no condition to overcome the tragic after-effects of Germany's surprise attack or to change the ratio of forces in the

1941. Assembly of PPSh submachine guns in a plant shop.

course of heavy single combat. And the fact that at Moscow the legend of the "invincibility" of the fascist Wehrmacht had been utterly dispersed was called a "miracle." But there are no miracles on earth. The Soviet Union withstood the enemy onslaught and won the first victory thanks to the fact that the party of communists made skillful use of the advantages of the Soviet social and state order, turned the country into a single armed camp, organized a coordinated and growing military economy, instilled in the men such qualities as steadfastness and courage, bravery and persistence, and sent to the front hundreds of thousands of its best sons. On territory under temporary occpation the Party organized a powerful guerrilla movement. The people's avengers delivered stunning blows against lines of communication, headquarters, communications centers, and enemy garrisons, frequently in close cooperation with chast' of the Soviet Army.

The victory at Moscow attested to a steady improvement in the combat mastery of our Armed Forces, further development of Soviet military art, and the growing maturity of command cadres. Achievement of victory was aided by a great deal of organizing and educational work conducted among personnel by military councils of fronts and armies, by Party organizations, and by political workers of soyedineniye and chast'.

The victory at Moscow was a vivid page in the annals of the Great Patriotic War. It gave a multitude of examples of organic combination of labor and military valor of the Soviet people. These eternally living examples excite the hearts and minds of our contemporaries. They teach utter devotion to our socialist homeland and our native Party of Lenin.

LINE OF GLORY

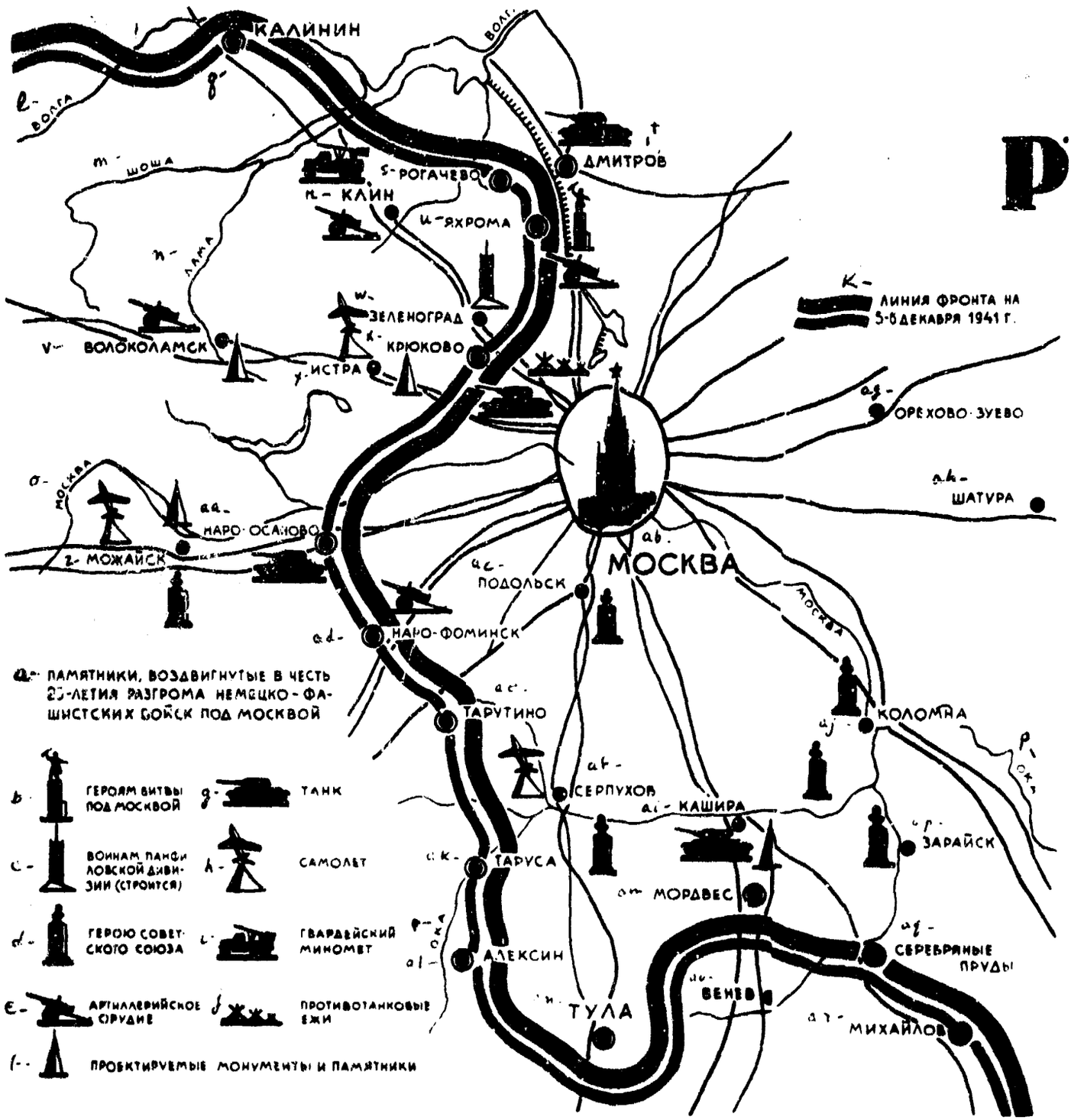
G. Gotsiridze, Hero SU, Chief Architect, Moskovskaya Oblast

At the 24th Party Congress Leonid Il'ich Brezhnev named the Moscow area as one of the places where monuments of combat glory rise as evidence of the unlimited respect of Soviet citizens for the memory of heroes who gave their lives for the Motherland. Here, at the initiative of Party, soviet, and social organizations in the very first days after the great victory, there began the erection of monuments, obelisks, and epitaphs, and the placement of marble and bronze memorial plaques. Later they erected the monument "To the Soldier-Liberator" on the Peresmilovskiye Hills near Yakhroma, a monument to Zoya Kosmodem'yanskaya on the Minsk Highway, the composition "Antitank Hedgehogs" on the Leningrad Highway, and a number of others.

The sculptors, architects, and artists who labored on already existing monuments and memorials did not set for themselves the task of depicting the scope and historical significance of the Battle of Moscow. Now this task has entered the decision stage. It is planned to create a unified memorial entitled "Line of Glory," which is to perpetuate the immortal deed performed by the Soviet people under the leadership of the Lenin Party during the period of the capital's defense.

This memorial complex, which, by the way, will include all present monuments and memorials, will stretch from Kalinin through the Moscow area to Tula, almost 550 kilometers. It is to embody the epopee of defense and counteroffense by our troops in artistic forms, with extreme authenticity, and with emotional expressiveness, reveal the grandeur of morale of the Soviet people, and show their steadfast resolve to save and defend their native Moscow.

In order to create a really grandiose memorial worthy of the bright memory of true sons of the homeland who died the death of the brave, it was decided to announce a competition for the best draft. Participants in the competition included the Moscow Oblast Architectural Planning Administration, the Chief Architectural Planning Administration of Moscow, Voyenproyekt of the USSR Ministry of Defense, the Moscow Architectural Institute,


КАЛИНИН
ВОЛГА
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ДМИТРОВ
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ЗЕЛЕНОГРАД
КРЮКОВО
ВОЛОКОЛАМСК
ИСТРА
ОРЕХОВО-ЗУЕВО
ШАТУРА
МОСКВА
НАРО-ОСАНОВО
МОЖАЙСК
МОСКВА
ПОДОЛЬСК
НАРО-ФОМИНСК
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МОРДВЕС
АЛЕКСИН
СЕРЕБРЯНЫЕ ПРУДЫ
ВЕНЕВ
ТУЛА
МИХАЙЛОВ
ЛИНИЯ ФРОНТА НА 5-6 ДЕКАБРЯ 1941 Г.
ПАМЯТНИКИ, ВОЗДВИГНУТЫЕ В ЧЕСТЬ 25-ЛЕТИЯ РАЗГРОМА НЕМЕЦКО-ФАШИСТСКИХ ВОЙСК ПОД МОСКВОЙ
ГЕРОЯМ БИТВЫ ПОД МОСКВОЙ
ВОИНАМ ПАНФИЛОВСКОЙ ДИВИЗИИ (СТРОИТСЯ)
ГЕРОЮ СОВЕТСКОГО СОЮЗА
АРТИЛЛЕРИЙСКОЕ ОРУДИЕ
ПРОЕКТИРУЕМЫЕ МОНУМЕНТЫ И ПАМЯТНИКИ
ТАНК
САМОЛЕТ
ГВАРДЕЙСКИЙ МИНОМЕТ
ПРОТИВОТАНКОВЫЕ ЕЖИ

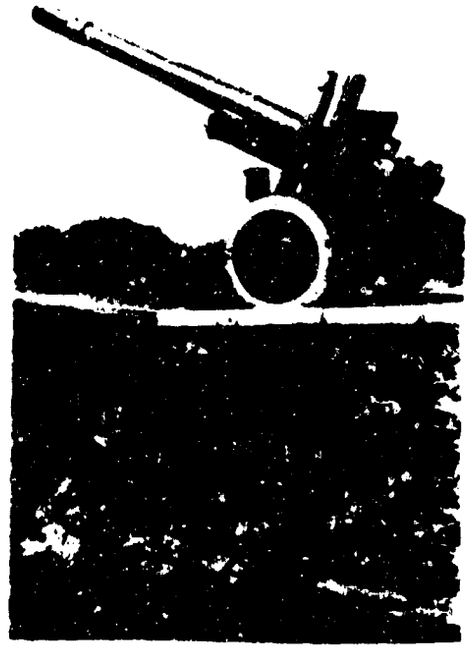
KEY: a -- monuments erected in honor of the twenty-fifth anniversary of the rout of fascist German forces at Moscow; b -- to heroes of the Battle of Moscow; c -- to men of the Panfilov Division (under construction); d -- to a Hero of the SU; e -- artillery piece; f -- planned monuments and memorials; g -- tank; h -- plane; i -- Guards mortar; j -- antitank hedgehogs; k -- front line as of 5-6 December 1941; l -- Volga; m -- Shosha; n -- Lama; o -- Moskva; p -- Oka; q -- Kalinin; r -- Klin; s -- Rogachevo; t -- Dmitrov; u -- Yakhroma; v -- Volokolamsk; w -- Zelenograd; x -- Kryukovo; y -- Istra; z -- Mozhaysk; aa -- Naro-Osanovo; ab -- Moscow; ac -- Podol'sk; ad -- Naro-Fominsk; ae -- Tarutino; af -- Serpukhov; ag -- Orekhovo-Zuyevo; ah -- Shatura; ai -- Kashira; aj -- Kolomna; ak -- Tarusa; al -- Aleksin; am -- Mordves; an -- Tula; ao -- Venev; ap -- Zaraysk; aq -- Serebryanyye Prudy; ar -- Mikhaylov.

This memorial Yak-3 aircraft, set up at the 96th kilometer of the Minsk Highway, is dedicated to defenders of the Moscow sky.

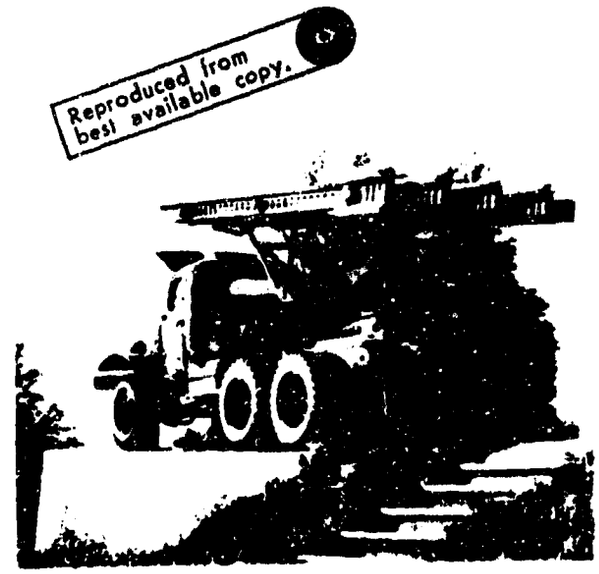
This renowned "34" stands near the village of Naro-Osanovo, on a line where men of Fifth Army blocked the fascists' path to the capital.

the Moscow Section of the Union of Architects, and other designing organizations. Competition participants developed the designs on a public basis.

Twelve designs were submitted in the competition, each of which had its inherent features, its creative credo. But there is also a common trend. This consists of restoring, where possible, the fortifications and command and observation posts -- in short, all elements of the defense; and to list



A 152-mm gun-howitzer has been placed on a base on the outskirts of Volokolamsk, where the Panfilov heroes fought.



The legendary "Katyusha" at the 113th kilometer of the Leningrad Highway, from which chast' of 185th Rifle Division moved into the attack in December, 1941.

Monument to men of 13th Battery, 864th AAA Regiment -- an 85-mm AA gun -- stands at the fork of the Rogachev and Lobnya Station roads.

A monument to Hero SU Zoya Kosmodem'yanskaya rises on the Minsk Highway 5 km from the village of Petrishchevo.

the names not only of the armies, corps, divisions, and regiments which fought, but also the names of all the men. The designs provide for wooded parks to be laid off along the "Line of Glory" where the terrain permits, and construction on this territory of memorial museums and areas for holding various mass activities such as meetings of veterans who participated in the battle and relatives of dead heroes. It has been unanimously proposed to erect buildings for rest and for tourists.

Of course, only a jury of public and military figures, historians, expert architects, sculptors, and artists will be able to fully evaluate the merits and deficiencies of the designs. For now, however, we can note what we think are successful proposals.

The project designed by a group headed by A. A. Savin has in mind breaking the "Line of Glory" into exhibit zones, in accordance with the actions of each army, and to erect a central ensemble in Moscow. Where the "Line of Glory" crosses railroads, highways, and water routes there will be symbolic monuments, and obelisks and steles will be placed where the most fierce engagements took place. Along the entire extent of the "Line of Glory" there would be a system of viewing areas. The central ensemble would include a monument representing a stylized fragment of the Kremlin wall with high relief depicting the combat exploits of partisans and people's volunteer corps, a main memorial building, meeting area, Victory Park, and places for the combat equipment and weaponry of that time.

The design made by a group headed by P. P. Zinov'yev centers attention on a tourist road passing along the line where Soviet forces halted the enemy rushing toward Moscow. Next to this broad (12 meters) concrete route, laid independently of the existing road network, are steles and architectural-sculptural compositions. The main monument is situated next to Zelenograd. At the focus of two wedge-shaped areas are enormous inclined elements directed westward. Their lateral planes end in 100-120 meter pylons. Central element of the composition is the sculpture of a Soviet soldier symbolizing the might of our Armed Forces.

Students A. Guk and R. Khaliulin of the Moscow Architectural Institute planned to create at sites of particularly stubborn battles, and also in Zelenograd and Tula, individual memorial complexes, with a central ensemble planned near the Minsk Highway where the village of Naro-Osanovo stands. The extent of the ensemble is around one kilometer. In this segment are Soldier, People's Volunteer, and Worker squares. Here too is the main square with museum, pantheon, and a sculpture of Nike symbolizing Victory. In the structure of the "Line of Glory" is the idea of a filled earth embankment which includes a reinforced concrete inclined element in the form of a gate, symbolizing impregnability. This element is also present in other memorial complexes of this project.

There is a unique project by a group from the architectural-design workshop of the Moscow Section of the Union of Architects, which worked under the leadership of A. S. Natal'chenko. The authors proposed erecting on the

"Line of Glory" in places of decisive battles people's memorial mounds. There would be 12 such mounds, all joined by a road of military valor.

The design submitted by a group from Shop No 12 of the "Mosproyekt-2" Administration headed by B. N. Tkhor takes as the planned basis of the "Line of Glory" the front line as of 5-6 December 1941, which is fixed in a green belt. At the most important points of this belt it is suggested that monuments, pantheons, and combat equipment and weapons museums be erected. The main part of the central ensemble is a monument around 100 meters high consisting of a museum situated at the base of a pantheon with an eternal flame. High-speed elevators will take visitors to the observation platforms. The composition is crowned by the figure of a soldier-liberator. He bears a symbolic sun, which personifies victory over the dark forces of fascism. The ensemble includes a helipad and vehicle parking area. A parade ground zone is set aside on the main square.

Authors of the project developed by a group at the Scientific Research and Design Institute of Genplan in Moscow under the leadership of V. I. Ivanov proposed erecting on the then front line memorial markers which are uniform in their architectural-artistic expression. A marker in the form of a bayonet 25 meters high is set at the intersection of the front line with highways, railroads, and rivers. The front line is broken into twelve sectors, on each of which is a monument in honor of the exploit of a particular army. The central ensemble is planned in the vicinity of Lobnya. The basis of the ensemble composition is the Hill of Immortality, built up from handfuls of earth from fraternal graves of the Moscow area. The hill is encircled by a circular wreath with eight pylons. A belt of eternal flame extends along the upper part of the ring. Another ensemble element is the Victory Monument. It consists of a platform 150 meters long with a sculptured frieze depicting defense of the capital. Between the Hill of Immortality and the Victory Monument is a ceremonial ground with stands in the form of steps.

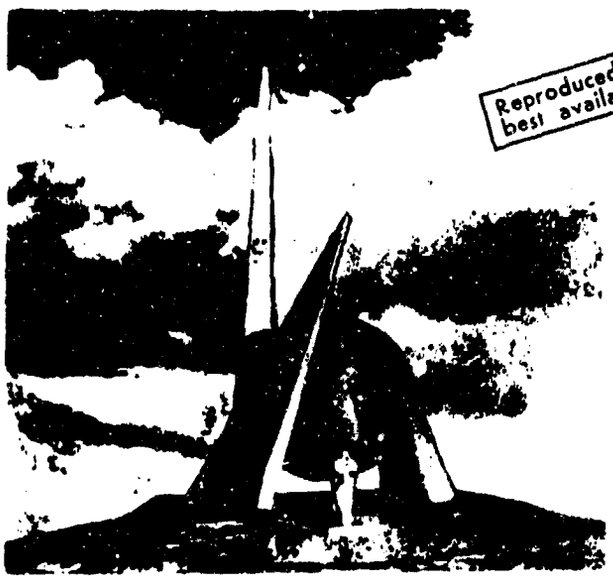
I would like to share with the readers the concept of our group.

In our opinion, the memorial complex should begin from the Kremlin, where the State Defense Committee operated during the Great Patriotic War, and extend to the west to the 74th kilometer -- the location of the village of Naro-Osanovo. In the vicinity of this village it is proposed to erect a central ensemble which, like the entire route beginning from the Kremlin, will comprise a basic compositional element of the "Line of Glory." Along this route, as we know, are placed memorials to the Patriotic War of 1812 and to the past war. They should be joined in a unified complex.

The Kremlin Wall from the side of Red Square should be decorated with a memorial plaque on the parade of troops on 7 November 1941. On Poklonnaya Mt. not far from the Triumphal Arch and the panorama of the Battle of Borodino, the project authors suggest placing a monument "The Motherland Beckons" against a background of swords directed westwards.

The central ensemble is a large complex of structures. At the beginning of the ensemble is planned an outer grounds, after which comes an area

for meetings and parades with, on one side, a monument called "Katyusha Volley" and a fraternal grave of heroes of the Moscow battle. On the east both areas are bounded by retaining walls with bas-reliefs depicting battles and enumerating all military ob"yedineniye and soyedineniye which took part in routing the enemy in December 1941. Along the sides of the main steps leading to the compositional center are sculpture groups of soldiers of all combat arms and people's avengers of the partisans.



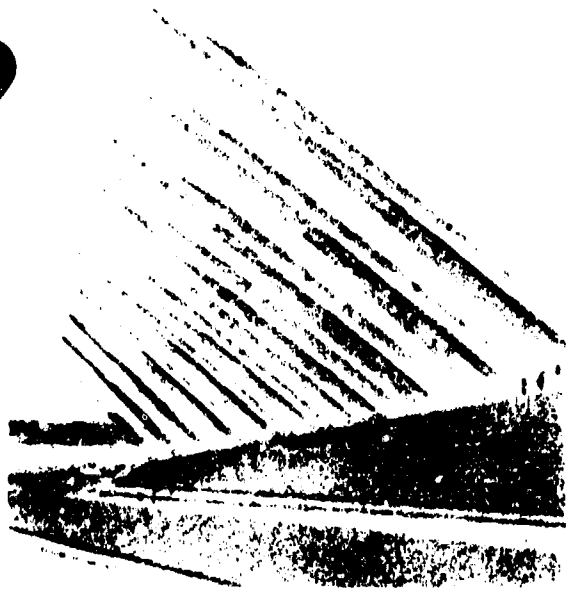
The center of the ensemble -- a globe soaring above a green hillock between three obelisks.

The center of the ensemble is a panorama of the battle in the form of a globe soaring above a green hillock between three obelisks. It not only catches the attention, but reveals the mass heroism of the Soviet people.

Two inclined obelisks symbolize the encounter of the forces of our people and of the fascist hordes. On the obelisks are raised scenes depicting, on one, the heroic actions of our people, and on the other, the evil deeds of fascism. The third obelisk is 170 meters high, and symbolizes Victory. The sculpture of a mother with a child in her arms, set in a green square before the memorial, personifies the continuation and renewal of life won in the battles against the foe.

The ensemble designs are calculated for use of light construction materials. The 60 meter diameter globe comprises two hemispheres of thin reinforced

concrete spherical slabs resting on a rigid box-like ring. The globe is connected with its supporting obelisks by transparent plastic junctions. The obelisks consist of assembled multistrut frames covered with reinforced cement or lightweight aggregate concrete decorative slabs.



The "Katyusha Volley" monument, part of the central ensemble.

Design of "The Motherland Beckons" on Mt. Poklonnaya.

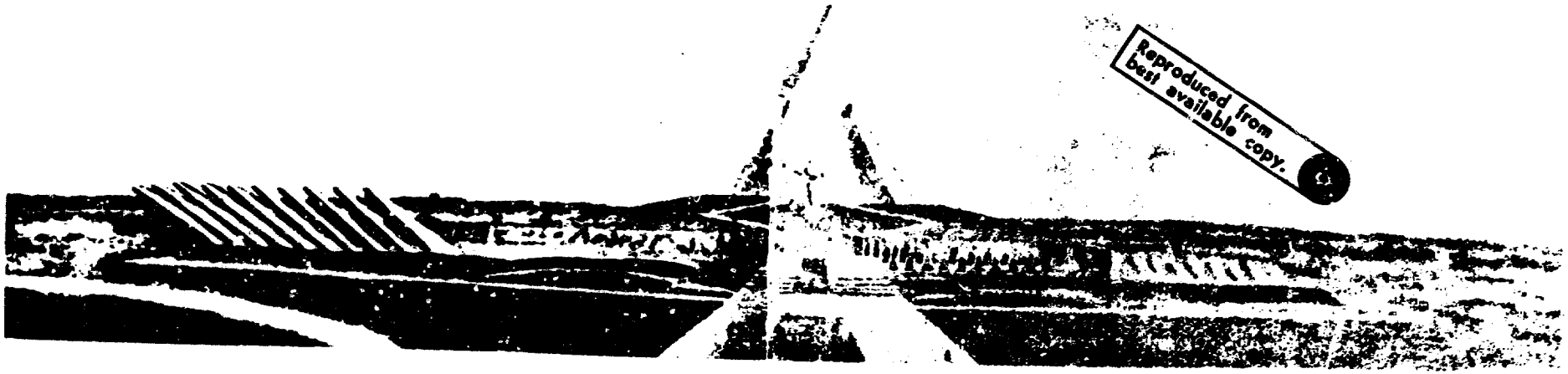
It is proposed to view the "Line of Glory" across its full extent and with its numerous memorial structures and restored combat sectors -- witness of the past war -- from a helicopter, which will stop at sites of the main battles (first priority of construction), and from a monorail road (second priority). Memorials constructed at or near junctions with railroads, highways, and water routes will be accessible for viewing from these forms of transportation.

As has already been said, all designs provide for restoration at the most important places of sectors of the front line of defense with trenches and complete dugouts, fire points, and wire obstacles. It is pleasant to note that local military commissariats and Komsomol organizations have already started this work. In August of this year over 35,000 Pioneers and schoolchildren on vacation in the area of the 1941 front line took part in restoration of defensive structures.

To embody in artistic works the heroic deed of our people and the will of the Communist Party, who managed to show the whole world in the very first months of the Great Patriotic War that the Country of Soviets was invincible is the most honored task of the architects and masters of the chisel and brush. At the same time, this is a complex task. In this regard it should be especially noted that all creative groups who took part in the competition did an enormous amount of preliminary work before submitting their projects (which took up almost 300 subframes). They thoroughly studied the historical research devoted to the battle and investigated in detail the terrain along the axis which, in the opinion of a particular group, deserved attention from the viewpoint of constructing there the central ensemble of the "Line of Glory." Useful meetings were held with military commanders who were direct participants in the events which took place in October-December 1941. Their tales about the battles and engagements helped the authors in their search for the artistic form of the memorial. We were given especially great help, and continue to receive it, from Twice Hero SU Army Gen D. D. Lelyushenko.

Today it is still too early to speak about the final appearance of the main memorial complex and its component parts. One can only say with complete confidence that the architects and sculptors, painters and dendrologists, engineers and workers are ready with their inherent enthusiasm to create the "Line of Glory," to create it so that it will serve to instill in new generations a spirit of utter devotion to the homeland, to the people, and to the Communist Party.

[Picture on next page]



Design of the central ensemble of the memorial complex of the "Line of Glory" near the village of Naro-Osanovo

IL'ICH WORKERS IN DEFENSE OF THE CAPITAL

V. Bogdanovskiy

Persistent, intensive work went on day and night at the Plant imeni Vladimir Il'ich. It was preparing "hedgehogs," which were immediately taken away and set up on streets and highways leading to Moscow. A large group of the Il'ich workers together with those of other Moscow enterprises were building defensive structures around Moscow. The plant donned the soldier's tunic.

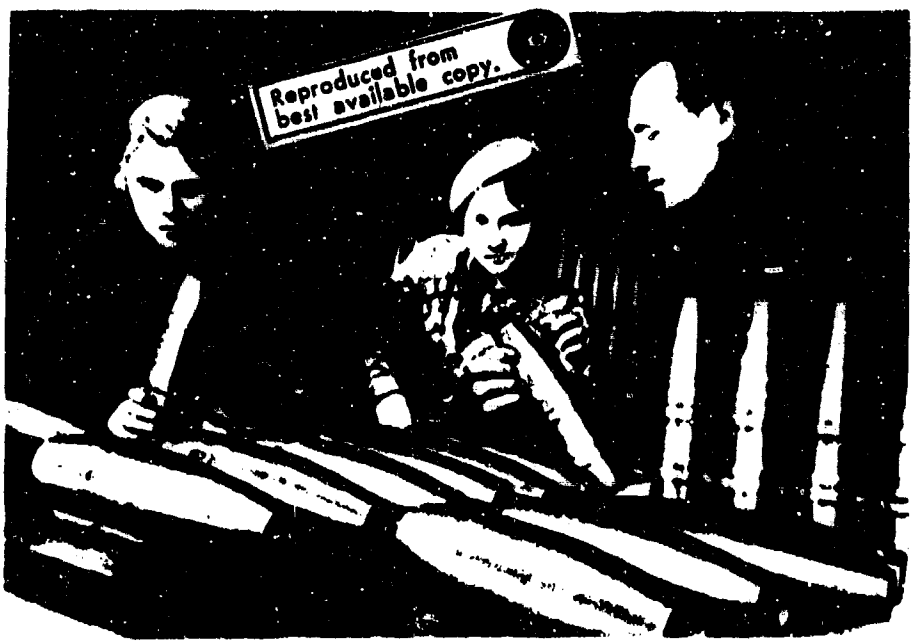
Hundreds of workers were departing for the army, and their near ones took their places behind the machine tools. When the brothers A. M. and D. M. Trebukhin were called up, they were replaced by their sisters, and after the head of the family left for the army, the mother of the Trebukhins also came to the plant. Ye. Konovalova, who saw off a husband and daughter to the front, became a machine operator. It was so in a majority of families.

As early as June 1941 plant workers L. Rubinova, N. Kuz'mina, T. Belova, L. Grishina, L. Posdnyakova, and others appealed to the Muscovites in a letter. "Our brothers, fathers, and comrades in work are leaving for the front," they wrote, "We are seeing them off to a victorious campaign against the fascist barbarians... For now, do not leave a single machine tool for a minute, nor cease the output of production for a minute." They called upon their girlfriends to master men's trades faster. This became a mass movement.

Instead of reduction gears for the Moscow subway and instead of pumps and machine tools, the plant began to put out defensive products. In a short time the production of articles for the front doubled, and then trebled. This became possible thanks to replanning and recutfitting of shops, mass training of workers in new specialties, and further increase in labor productivity. A number of shops, including the pattern and pump-machine shops, were recutfitted completely with consideration for military orders.

The plant's director V. Bazarov, Chief Engineer S. Moskalenko, Party committee secretary L. Nikitskiy, and plant committee chairman M. Podkopayev visited all the enterprises in Moscow to pick up the equipment needed to

expand production. The plant made more and more shells for artillery pieces and rocket launchers. They organized production of Molotov cocktails for fighting fascist tanks.



Ammunition to the front.

The nearer the enemy came to the sacred walls of the capital, the harder the Il'ich men worked. At the same time, they also were engaged in military training. The plant organized groups of tank destroyers, machine-gunners, and riflemen. Military training was headed by rate fixer A. Putankin. Workers and employees who were considered unfit for service in the ranks of the Red Army for reasons of health at that time quickly mastered military specialties which were new for them. Many later entered the ranks of the Moskvoretskiy Division of people's volunteers, which defended Moscow on the Maloyaroslavets Axis.

On 10 October 1941 the State Defense Committee passed a decree on evacuation to the deep rear of a number of Moscow enterprises. They evacuated the equipment of the main shops almost fully at the Il'ich plant, too. The majority of skilled workers and engineer-technical men went east. By 1 November less than a fourth of the machine-tool inventory remained at the plant.

But in spite of this, the small collective successfully carried out the assignment. The Battle of Moscow guided all their work. The plant Party committee secretary wrote in Izvestiya that the entire collective was now imbued with the thought of providing the front with as much weaponry as possible. The workers were ready to work and were working as much as was needed.

Where before days were needed to do something, now, it turned out, several hours were sufficient. The tempo of production grew with each hour.

The Party and Komsomol members labored selflessly. Some of them, after completing the work in their sector, helped others. At the Party members' initiative, the workers adapted training machine tools moved to the shops from a trade school for producing shells. The Komsomol organizer of one of the shops, Fedotov, working as a troubleshooter, completed his assignment and also fulfilled the duties of supervising foreman.

The flow of ammunition expanded with each passing day. "Everything for the front, everything for victory!" The Il'ich men, as did all the Soviet people, worked under this motto. Ye. Nikiforov, V. Kus'mina, and A. Kopeyko fulfilled two norms in one shift. Worker V. Kabanov was awarded the Order of Lenin for exemplary fulfillment of his assignment. The machine tool on which he worked in those menacing days is now on display in one of the halls of the Central Museum of the USSR Armed Forces.

Production commanders S. Skorikov, D. Panov, and S. Nevstruyev set up multimachine-tool work. D. Sanina, A. Sukhina, T. Tutayeva, Ye. Baldokhina, and P. Kurochkina produced over two norms in serving several machine tools. The machine tools which were the responsibility of troubleshooter B. Belolipetskiy and foremen P. Talykin and S. Zarubin as far as working order goes did not stop for a single hour. The sector of troubleshooter P. Trofimova, which included 18 machine tools, overfulfilled the scheduled tasks day in and day out.

The Il'ich men displayed much imagination and resourcefulness in that severe autumn. In order to supply intermediate products to the sector manufacturing armor-piercing rounds -- the products had previously come from Stalingrad -- the head of the forge shop A. Chernikov set up their production using simple hammers. It is difficult to believe, but that is how it was. Subsequently they adjusted the production of cast iron shells. And the foundry not only of our plant, but of the Plant imeni Voykov, began to provide intermediate products.

Cast rounds from ferro-steel possessed considerable advantage in their inner surface, which, except for cutting of grooves for the detonator, did not require mechanical processing. But how much work was put in until the manufacture of such shells was adjusted!

We also had to change the composition of the molding sand used to manufacture the special rods so necessary for obtaining exact sizes of the shell's inner cavity. Tens of tons of sunflower seed oil could not be permitted to be used for its manufacture. Plant rationalizer and old Party member M. Kimmel', who worked for long years at our enterprise, suggested a new composition for the binder. Now we only needed a small amount of cement and did not require a single drop of sunflower seed oil. We made a test set of rods, molded the shell, made a casting, and... drew the new rod out of it with extreme difficulty.

In the machining shop.

The rationalizers helped. Under the leadership of foremen Ya. Veselov and G. Budanov they developed a special device by which it was possible to remove the rods quickly. Things went well. The machining sectors, which were constantly supplied with intermediate products, began to systematically overfulfill quotas. It was in the machine shop that turner Aleksandra Lezina worked at that time, having replaced her husband when he left for the front. Quickly mastering the difficult trade, she attained a high labor productivity. The motto "Defenders of Moscow, the Soviet people are with you!" hung in the shop bay over her machine tool. It was a constant reminder to her that she, too, was on the forward edge of defense. For her selfless labor during the war years, Lezina was awarded the Order of Labor Red Banner and Soviet Union medals. The labor of Aleksandra Lezina in peacetime was also noted by the government. In 1971 she was awarded the high title of Hero of Socialist Labor.

At a Party meeting which took place on 17 November 1941 the plant Party members pledged to take maximum advantage of the available plant capacity to increase the output of military production. Their word did not differ from their deed. The plant collective overfulfilled the November schedule for output of armor-piercing rounds by 40 percent, and of Katyusha rounds by 20 percent. The mechanical repair shop, having organized the production of mortar rounds and mortar parts, gave the front the promised goods.

And when the joyous news came about the failure of Hitler's plan to encircle and capture Moscow, and about the panicky flight of the enemy, the Il'ich men understood that their work too helped rout the invaders.

As during the past war, Aleksandra Lezina -- now Hero of Socialist Labor -- labors selflessly as before in her native plant.

On 14 December 1941, at a general plant meeting devoted to the deeds of the heroic defenders of Moscow, the Il'ich personnel made new socialist pledges. The plant collective pledged to overfulfill the December schedule, raise labor productivity in comparison with November's by 20 percent, and lower the prime cost of articles.

Overcoming enormous difficulties, the plant worthily fulfilled the December plan. By January 1942 it increased the output of military products by more than 13 times and increased its quality immeasurably. By Ukase of the Presidium of the USSR Supreme Soviet of 20 January 1942, the plant was awarded the Order of Lenin for exemplary fulfillment of its quotas. Foremost production workers also received governmental awards. This is how highly the Motherland valued the contribution of the Il'ich workers to the rout of fascist troops at Moscow.

Thirty years have gone by. Veterans of the Great Patriotic War are working at the plant even now. Military pilot S. Zaytsev traded the stick of his aircraft for a complex balancing machine. Senior technician Ye. Zubtsova of the section of the chief technologist was a searchlight operator in the past. In the fighting year of '41 she helped destroy enemy vultures. The energy of the veterans is not decreasing. The majority of them are foremost production workers, and their portraits grace the Honor Plaque.

The young people have come to relieve the generation of Il'ich personnel, who have made their labor and combat contribution to the cause of victory on fronts of the Great Patriotic War. This worthy replacement is multiplying the glorious traditions of their fathers. They are working in

such a way that they are looked on with pride by their older comrades — those who in the threatening days at the end of 1941 defended Moscow. The crown of the crop this year were awarded the Order of the October Revolution. Among them were metal craftsman K. Sakharov, shop foreman M. Butylkin, grinder V. Zaitkin, and metal craftsmen N. Kuzmenkov and S. Penkin.

As before, production is being improved by the efforts of innovators. Everything that is new and advanced is being introduced at the plant. Quite recently, in answer to the CPSU CC Decree "On Further Improvement in Organization of Socialist Competition," a trade group of toolmakers turned to their labor comrades with an appeal to begin a competition under the motto: "Wings to the new!" The toolmakers reviewed the pledges made in honor of the 54th anniversary of the Great October and worked out an imaginative plan. It provided for the introduction at each work area of the most rational equipment which is demonstrated in pavilions of the Exhibition of Achievements of the National Economy (VDNKh).

Together with the technologists, the workers have already outfitted their sector with the latest pneumatic tools. Models of these tools were displayed at the exhibition. Members of the trade group themselves are working on various new things. In recent years they have introduced into production around 500 of their suggestions. The most interesting of them are being shown at VDNKh SSSR.

The introduction of foremost experience of innovators at each work area will, according to preliminary estimates, permit the sector to complete the annual plan a month earlier than schedule. Each of the competition participants will reduce labor expenditures by 100 norm-hours and as a result will put out much additional tools, which are so necessary to the plant for further increases in the output of products with the trademark ZVI /Elektromekhanicheskiy zavod imeni Vladimira Il'icha; Electromechanical Plant imeni Vladimir Il'ich/.

STANDARDS AND QUALITY

V. Boytsov, Chairman, State Committee for Standards, USSR Council of Ministers

"Increase the scientific-technological level of standards and their role in improving the quality of products."

from 24th CPSU Congress Directives

Considering its highest duty to be concern for the welfare of the Soviet citizen, our Leninist Party at the 24th Congress determined the main task of the ninth five-year plan to be ensuring a considerable rise in the material and cultural standard of living of the people on the basis of high rates of development of socialist production, an increase in its effectiveness, , scientific-technological progress, and acceleration of the growth of labor productivity.

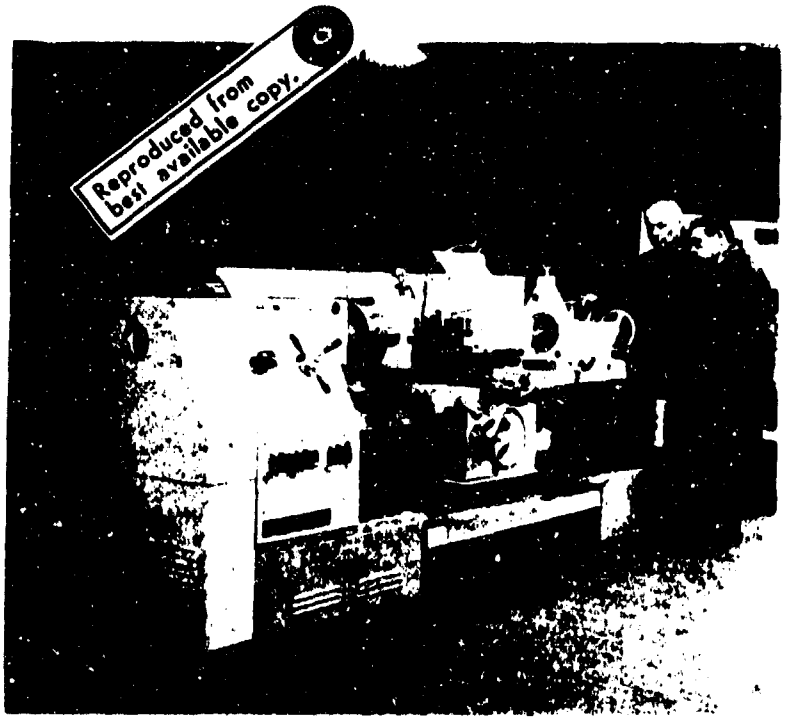
The heightened demands placed on standards are called upon to aid in the successful accomplishment of this task. Congress directives provided for renewing existing standards and technical conditions, providing for the replacement of obsolete indicators and timely reflection of demands of the national economy, which guarantee a high technical standard and quality of products.

Our country's experience in industrial development shows that standardization is among the most effective means for accelerating technological progress. This is understandable, since the quality of products depends primarily on the degree to which raw materials, supplies, half-finished products, and sets of articles correspond to demands of the standards. The principle accepted in our country of complex standardization, which provides for simultaneous increase in quality both of raw materials and of ready products, permits control of quality beginning with the first stages of production.

Thus, to raise the quality of electrical transformers, among the 36 standards there are those for transformer steel, insulation, and oil. The same can be said for electric welding equipment. Not only welding trans-

formers and aggregates have been standardized, but also the materials needed for their manufacture and devices for welding work. Standards have also been confirmed which define the demands on quality of welding joints and methods for their testing.

In the new five-year period the examined principle of standardization is receiving ever wider application.



In the "USSR Standards" Pavilion at the VDNKh. Model 16B25P screw-cutting lathe, manufactured with observance of modern demands of technical design.

Technological progress of industrial production will be greatly facilitated by development of long-term standards. These standards are made to include such quality indicators which can be attained by industry in certain time segments.

A variety of the long-term standard is the stepped standard. An example could be the standard developed in this country for condensers to increase the capacity of electrical installations. It provides for the output of three series of these articles. Each subsequent series differs from the previous one by more improved design and in its technical characteristics.

The standard for copper ingots used by the electrotechnical industry is no less convincing an example. As early as 1960 it was established that

a number of indicators of copper ingots should and could be improved in a 6-7 year period. The planned level was in fact reached in 1967. At present these ingots exceed similar international models in level of quality. By 1973 it is planned to increase their quality even more.

Long-term and stepped standards will improve the technical parameters of articles of industry. However the time has come to switch to use of leading standards developed on the basis of predictions of developmental tendencies of science, technology, economics, and labor organization. The first results already obtained by individual branches of industry are convincing in that standardization based on scientific predictions will lead to further increase in quality and technological indicators of a number of articles.

Let us take the production of instruments. Now the life of a system of compatible EVM [elektronnaya vychislitel'naya mashina; electronic computer] is calculated as six years. By 1975 it will reach ten years. Their speed will increase from one to three million operations in a second. Mean cycles between failures of keyboard computers will increase from 320 to 1,000 hours. In the five-year period it is planned to develop 190 new GOSTs, 960 OSTs, and around 3,000 technical specifications in instrument-making.

The quality indicators of individual types of products which will be attained by the end of the five-year period in the electronics industry will allow radioelectronics to rise to a new level. While today the integral circuits of articles of mass production have mean-cycles-between-failures of 5,000 to 8,000 hours, by 1975 this will equal 10,000 hours. This same indicator for receiving amplifier tubes and picture tubes for color television will increase twofold. The mean-cycles-between-failures of semiconductor instruments used in color television will increase from 8,000 to 10,000 hours. In this branch of industry it is planned to develop and place into operation before the end of the five-year plan over 800 GOST [Gosudarstvennyy obshchesoyuznyy standart; All-Union State Standard] and OST [Obshchesoyuznyy standart; All-Union Standard].

An effective form of influence of standardization on quality of products is the introduction in our country of a system of State certification of particular articles by a "Mark of Quality." It is very apropos that special standards are developed and approved on products marked in this way. The indicators involved correspond to those of the best foreign models, and in a number of cases exceed them. It is planned here that with time conditions will be created for putting out products with high quality indicators not only in individual enterprises, but in the entire branch. It is quite obvious that such standards, being branch standards for quality of products, considerably stimulate technological progress.

Among the most important measures ensuring further development of standardization is the introduction of a number of general state systems of standards such as the Uniform System of Design Documentation (YeSKD), introduced as of 1 January 1971. It replaced 26 methods of formulating design documentation which were not related and which complicated the transfer of production of articles from one enterprise to another.

The YeSKD has established a uniform procedure for organization of planning, thanks to which the cycle of design work has been considerably shortened and amount of work required has been reduced. According to preliminary calculations, this system will make it possible to increase the labor productivity of designers by 20-25 percent. It creates the basis for mechanization of design work and for broad application of electronic computers in design bureaus and industrial enterprises.

Of no less significance is the introduction of the Uniform System of Technological Preparation of Production (YeSTPP). It establishes a firm procedure in developing technological documentation, introduces fundamental changes in the principles and methods of production organization, and permits cutting production times in half and reducing 1½-2 times the cost of preparation. This will undoubtedly sharply increase the working efficiency of industrial enterprises.

Typification of technological processes in industry at the end of the eighth five-year plan comprised 10-15 percent. In the current five-year period it should be taken approximately to 60-70 percent. This means that the cycle and laboriousness of technological developments will be reduced by more than a third. The quality and level of technology of series production will rise. With the introduction of YeSTPP the use of standard rigging will expand.

Renewal of machines and instruments put out takes place rather quickly at present. Articles, as a rule, are in series production around two and a half years. Under these conditions technological rigging becomes obsolete before it wears out. At the same time the time for beginning output of new articles is determined by the time needed for planning and for outfitting production. Standardization of technological equipment has become one of the current tasks. Now standard equipment in industry already comprises approximately 15 percent. As calculations show, its increase to 70-80 percent will allow reduction of the overall labor consumption and times for manufacturing equipment by more than two times, which will permit a considerable expansion of the scale of mechanization and automation of production.

In fulfilling the decisions of the 24th CPSU Congress, the State Committee of Standards together with ministries and departments, scientists and designers, is preparing and approving many new progressive standards. An effective supervision over their adoption and observance will permit a sharp rise in quality of all industrial products, and will be a substantial contribution toward resolving the main task of the ninth five-year plan.

Realization of the measures outlined by the Communist Party and Soviet Government for expanding and improving work in the field of standardization will raise it to a higher level, will represent a considerable contribution to further development of scientific-technological progress, and will increase reliability and life of native technology.

LETTER TO THE EDITOR

In the article "Graphic Instruction," published in No 7 for 1971, an important question is raised on improvement in instructions and ways to increase the effectiveness of operator training, as noted in his letter to the editors by Deputy Commander-in-Chief of National Air Defense Forces Lt Gen N. Grishkov. Swiftness and correctness of actions in the practical work of operators depends not only on the state of training of crews, but on the quality of instruction manuals. It is very important, he writes, that rules and instructions reflecting the scheduled actions of an operator are sufficiently expressive and ensure rapid receipt of accurate and brief information.

Such demands are met by the rules or instruction booklets which contain individual commands represented by symbols. They make it possible to quickly grasp the entire sequence of actions. Graphic depiction of results make it possible to reduce the probability of errors. All this is a great plus for symbolical representation of commands.

These kinds of rules and instructions can be successfully used where there is a precise sequence of actions connected with a process, the beginning and end of which are strictly determined in time (for example, switching on an apparatus, controlling its functioning). It is well to think about duplicating ordinary instructions which are hung at the operators' working areas with uniform and easily memorized symbols.

It is desirable, Lt Gen Avn N. Grishkov notes in conclusion, that as many people as possible become familiar with the article "Graphic Instruction" who are involved in training operators and organizing their work.

INCREASING LABOR EFFECTIVENESS

Engr-Lt Col V. Murashev and Engr-Capt F. Korobeynikov

The 24th CPSU Congress set before workers of industry concrete tasks of increasing labor effectiveness and making fuller use of internal economic reserves.

All this also fully relates to military repair organs, for maximum utilization of production capacities not only facilitates economy measures and increases in labor effectiveness, but also reduces the time which combat equipment remains in repair.

Inasmuch as one of the ways to increase the effectiveness of repair work is the adoption of working areas which meet the demands of scientific organization of laobr, the servicemen, workers, and employees of our enterprise have actively joined in a competition announced by editors of the journal Tekhnika i vooruzheniye, by the inventions division of the USSR Ministry of Defense, by the Presidium of the VOIR /Vsesoyuznoye obshchestvo izobretateley i ratsionalizatorov; All-Union Society of Inventors and Rationalizers/ Central Council, and by the directors of the Exhibit of Achievements of the USSR National Economy.

We have already adopted several types of working areas created according to models recommended by the journal. These models were subjected to certain constructive changes in conformity with the conditions at the enterprise.

For example, the locksmith work area consists of a bench with drawers and a rotating chair. On top of the desk is a detachable screen made of sheets, the light of which is chosen depending on the degree of illumination. It has ball-type clamps for holding drawings. The drawers have special compartments for tools. The bench has four outlets, which allows use of electronic tools. For convenience the outlets are covered with a swiveled sector cover having a spring stop. In addition, a special 220 and 36 volt converter is provided. On the left of the bench is mounted a textolite table and on the right is a cabinet with stop. The necessary writing and

drawing work can be done on the table. The cabinet is designed for storing drawings and other documents. The bench is equipped with a detachable rest which allows working on long items. The desk top has local illumination (daylight lamp). Now the necessary tools and drawings can be conveniently stored and the worker makes no extra movements.

Rationalizers V. Lisyunin, an employee of the Soviet Army, and Pvt N. Kuznetsov altered the work position for the welder (see sketch). It is a desk 1250x450 mm, a portable rotating chair, and a cabinet. The height of desk and chair can be changed depending on the size of the worker. The desk has individual exhaust ventilation to draw off gas and air. In addition, it is equipped with two drawers for storage of electrodes, tools, and devices needed in welding.

The cabinet size is 1250x810x585 mm. It is all-metal welded construction with two doors which can be locked and two catches. To one of the doors are secured two boxes made of sheet steel, and to the other are welded little shelves. The boxes hold documents, as well as small parts for the cutting torch, while the shelves hold small torches. Within the cabinet are installed six metal drawers for electrodes, tools and welding accessories. There is also a shelf for large tools and devices, as well as four brackets: two that are shaped so that cable can be wound, and two others on which the welder's goggles are hung. A spare parts kit is contained in the cabinet.

A movable table has been made for the preservation mechanic [slesar' po konservatsii]. Its frame is welded from 20 mm pipes, and three shelves are made of sheet steel. On the right and left sides of the desk have been welded boxes also made of sheet steel, which are for holding the container of liquid and brushes. Tools and devices are placed on the desk top.

The work position for the repair mechanic for electrical measuring instruments and automatic equipment was designed by Capt B. Tikhomirov. It has two parallel desks two meters apart, a cabinet, and a one-pedestal

desk. The desks are metal and the tops are covered with viniplast sheets. On one of them, where three work positions are provided, is placed the apparatus for checking and repairing electric measuring instruments which operate on ac or dc. In the desk at each work position there is a drawer with compartments for tools and devices used by the individual. The front panel of this desk has three installed intermediate sockets, each with five plugs, for hooking up to 220 volts ac. There are two more intermediate sockets on the table to make it convenient to conduct a technical inspection and repair electric measuring instruments. The other desk holds coil-winding machines and various devices for cutting glass, tightening tension members, pressing cores, and repairing frames of electric measuring instruments. In addition, the cabinet of the desk has a unit installed for magnetizing with alternating current the magnets which are part of the electromagnetic system of electric measuring instruments. The one-pedestal desk is equipped with drawers for group tools and the appropriate repair documents.

Rationalizers have also outfitted a turner's work position in conformity with our conditions. It consists of a welded revolving cabinet made of angle iron and sheet steel, a movable rack, and a container for collecting waste. The cabinets have been made for one and two work positions. They differ in that the cabinet for two work positions is separated by a vertical divider into two parts, each of which is covered by two doors with a hasp and two catches. Within each cabinet are installed two large and four small drawers and seven open containers designed for storing necessary tools, accessories, devices, and intermediate articles. The movable rack, which is of pipe construction and has several shelves, contains intermediate products and finished articles.

In addition to the work positions recommended in the journal, our enterprise has created and adopted equipment providing for a high labor effectiveness of specialists and other trades. For example, the work position at which load testing of special aggregates is performed is set up on an open concrete slab. It has a rotating boom and electric hoist, which permits loads weighing up to 500 kg to be lifted up to 10 meters. On a movable table is a set of tools and tackle.

The new work position set for the harness-maker includes two large movable tables covered with bakelized veneer and a hoist by which heavy covers are lifted and moved. This considerably reduces heavy manual labor. The designer of this work position was Engr-Maj A. Gubskov.

With the adoption of work positions meeting demands of scientific organization of labor, we were able to better organize work, lay out tools, devices, and materials more rationally, preclude nonproductive movements, observe sanitary norms, and raise labor culture.

WE IMPROVE WORK POSITIONS

Engr-Lt Col E. Slyusar' and Soviet Army Employee A. Popkov

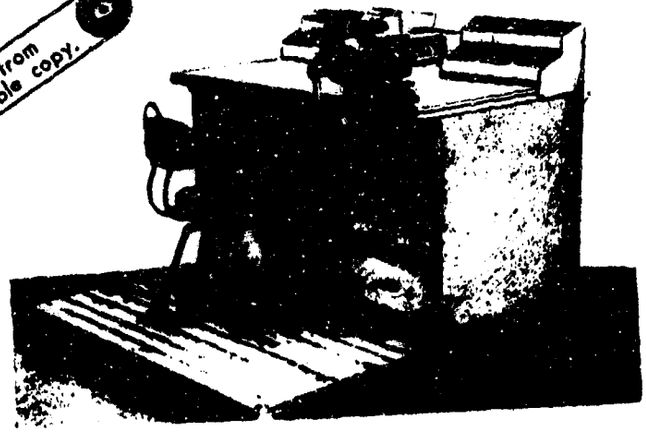
Our enterprise, which in 1970 was awarded the title "Enterprise of High Culture of Labor Production and Organization," has given great attention to the question of improving work positions. This work is constantly in the field of vision of the council for scientific organization of labor, the technical and design departments, the inventions commission, and the VOIR [Vsesoyuznoye obshchestvo izobretateley i ratsionalizatorov; All-Union Society of Inventors and Rationalizers] council.

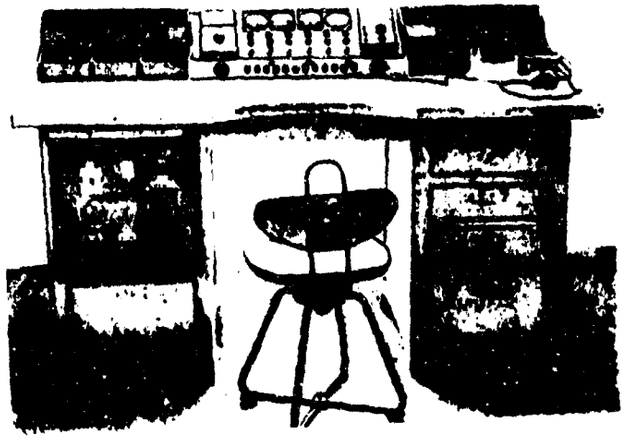
The competition for adoption of the most rational outfitting of work positions announced by the editors of Tekhnika i vooruzheniye, the inventions department of the USSR Ministry of Defense, the VOIR Central Council, and the directors of USSR VDNKh [Vystavka dostizheniy narodnogo khozyaystva SSSR; Exhibition of Achievements of the USSR National Economy] has helped concretize our search.

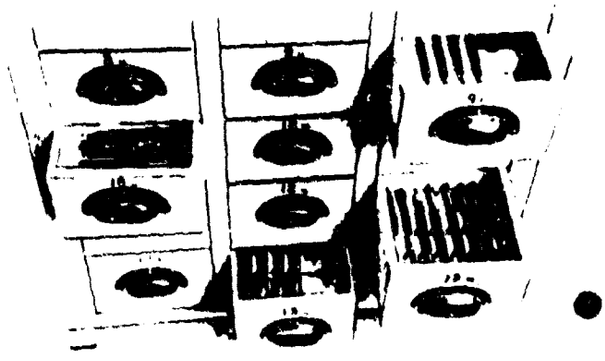
The enterprise set up a competition commission which developed a plan for adopting the rational outfitting of work positions. Competition conditions and the appeal of the inventions commission and VOIR Council to the rationalizers and personnel to take part in the competition were put up in all podrazdeleniye and brought to the attention of all personnel through representatives of inventive and rationalizing work.

First the commission selected the equipment for the work positions to be submitted for competition. Comparing the work positions recommended by the journal and developed by us, it chose equipment which answered most fully the production conditions. Test models were prepared and set up in shops and departments for comprehensive check. This permitted exposure of deficiencies and elimination of them with the final outfitting of work positions.

We have presently adopted the equipment for work positions of fitter, turner, milling machine operator, radio assembler, welder, and tracer. For example, the fitter's work position (Fig. 1) consists of a bench with drawers







containers for various purposes, a platform adjustable in height by its legs, and a rotating chair. The work position of the machine tool operator (turner, milling machine operator, planer) consists of a cabinet and two special stands for intermediate products, and the machine tool equipment and accessories. The radio assembler's work position (Fig. 2) is a special bench with unified power unit and control unit. The work position for a gas-electric welder is equipped with a special table, rotating chairs, and intake-exhaust ventilation. Placement of tools in drawers is shown in Figure 3.

The enterprise group pledged to outfit at least 60 percent of the work positions with equipment meeting the demands of scientific organization of labor by 1 December 1971. This will permit a considerable increase in the effectiveness of our work. It will raise labor productivity and improve the production culture and quality of products.

SUGGESTED BY RATIONALIZERS

Lt Col N. Tamanov

Having entered in the competition announced in Tekhnika i vooruzheniye, our rationalizers developed a convenient radio expert's work position. It consists of two cabinets and a cart. The frame of the cabinets is welded angle iron 30x30x4, covered on the sides and rear by sheet steel 0.8 mm thick. The table tops are covered by duralumin sheet 1.5 mm thick. A three-wheel cart (5) is secured between the cabinets, which are placed at an angle to each other, with mechanical clamps (4). On the cart is mounted a rotating holder (8) for securing the unit to be repaired in the necessary position, or the cart may hold any other equipment required. The left cabinet (3) has a drawer (2) installed which holds documentation, and it has a power unit panel (1). The right cabinet (9) has drawers (10) for tools and small parts.

Rod (7) can be used to affix the rotating holder of a local lamp (6), diagrams of the article under repair, or a fan.

TANK POWER PLANTS

Engr-Maj A. Yepikhin

Such very important combat qualities of a tank as its mobility and cross-country ability are affected by the maximum and average speeds which it is capable of developing while moving along various roads or off the road, and also by the distance it can travel on one tank of fuel. Therefore, foreign specialists devoted most attention to creation of an engine which would have such great power, minimum size and weight, and which could conveniently be arranged in the tank's engine compartment. They also strived to ensure that it would turn over easily and reliably under any temperature conditions without special preparation, and that it would operate in any climatic belt and under water. Thanks to development of industrial production, part of these demands were met. However the appearance of atomic weapons required, on the one hand, a still greater reduction in vulnerability and on the other, an increase in mobility of tanks, which again forced a search for ways to increase the power and reliability of power plants.

Statements can be encountered to the effect that increasing the reliability and reserve of motor resources and ensuring high maintainability of the engine with minimum expenditure of time for servicing is a task which is completely possible to accomplish if a unique design is created. However it is believed that it could hardly be suitable for mass or large-series production. Therefore at present designers are taking advantage of the latest achievements of science and technology and, taking into account the Army's rigid requirements, are improving diesel engines and developing multifuel, gas-turbine, and rotary engines. It should be noted that the main content of all searches, at least for the time period in question, is a drive to sharply increase the power characteristics and decrease the size of power plants.

The diesel engine took over a firm place in the power plant of tanks and armored personnel carriers. This was caused by its high efficiency and reliability and by the fact that it operates on a cheap and relatively safe -- from a fire standpoint -- fuel. All this together goes to fulfill the demands placed on tanks. But the diesel continues to improve.

A tank's speed depends on its overall power. It is this which people plan to increase by 2-2½ times without changing the size of the power plant.

There are also continued improvements in arrangement of V-model engines and increases in the rigidity of their structures. This is not by chance, since by choosing the optimum angle of flare between cylinder blocks we achieve the required ratio of engine height to width and the most rational placement of auxiliary equipment between the blocks which permits convenient access to them from above. The advantages of such a scheme include, in part, the simple accomplishment of air cooling of the cylinders.

A tank power plant with air cooling, with power of engines being the same, usually has a smaller size and weight than one with liquid cooling. This is caused by the absence of radiators and pressure tanks. Less air is used to take the heat away from the engine than in cooling the radiators of a liquid cooling system. Engines with air cooling require smaller fans and less power expended to drive them. In addition, liquid cooling systems are filled with special antifreeze. However, additional containers are needed for storing such liquids, and the systems filled with them must be frequently inspected and maintained.

The overall power is proposed to be increased by a high boosting, by increasing the supercharging, and by using a number of other design decisions. It is being attempted to boost the engine by considerably increasing the average effective pressure.

Boosting involving an increased rpm leads to great technical difficulties. The average speed of the piston increases in proportion to the increase in revolutions of the crankshaft. The stroke of the piston is decreased in order to avoid this excessive increase (over 13 m/sec). Changes are being made to the design of the piston itself to limit high loads -- new elements are being mounted which permit automatic adjustment of the degree of compression.

The specialists' efforts are being directed also toward increasing the fuel efficiency of tank diesel engines. A perspective solution in this direction is considered to be the use of supercharging from the centrifugal compressors.

Individual assemblies of diesel engines are being modernized for the purpose of increasing their reliability. The United States has manufactured a diesel in which each cylinder has its own head with four valves. Pistons are made of a light alloy. They are cooled by streams of oil. To make starting easy in low temperatures, glow plugs are placed in precombustion chambers. There is a one-piece housing in other versions of an air-cooled engine. Aluminum cooling ribs are placed on the outer surface of cylinders made of high alloy steel.

The conclusion was reached after numerous investigations that it is possible to reduce the size of tank engines only by miniaturizing each element of the engine itself and its assemblies as well.

In creating foreign multifuel engines, the designers went in various directions. Thus, the basis of operation of a multifuel engine created on the base of an ordinary diesel is the principle of hypercyclic combustion of fuel. In this engine the admission port leading to the valve has a shape which causes the air to eddy on entering. The fuel first hits the walls of the internal piston combustion chamber and forms a film on them. Around five percent of the liquid fuel mixes directly with the air in the form of small droplets, i.e., self-ignition is set up in the same way as in an ordinary diesel engine. During the next phase the formation of an eddy is maintained by the continuing injection of fuel and by its combustion. There is an intensive evaporation of the fuel film, but inasmuch as not all the fuel burns, but only the part which evaporates on the chamber walls, the combustion process takes place evenly, without a sharp increase in pressure and with high thermal efficiency.

Changes were made in the design of the combustion chambers, as well as in other assemblies and units of the engine, so as to ensure complete combustion of the various liquid fuels with a different ignition temperature. For example, on the fuel pump an adjustable control rack stop was mounted, and the pressure created by the operating pump was increased. This was done in the hope of precluding the possibility of formation of vapors in the intake cavity of the high-pressure pump and improving the filling of the volume above the plunger. Taking into account that the density of light fuels is low, the pumping system is made to be continuous and with special seals and vents to prevent gasoline from getting into the oil.

Such requirements placed on the engines of combat vehicles such as quick starting in low temperatures led to the need to install torch preheaters for the intake manifold which switch on when the engine is turned over and which operate until the engine warms up.

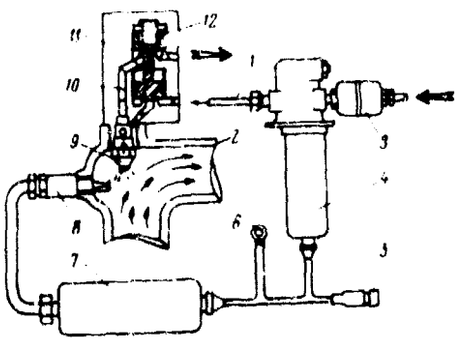


Diagram of a torch preheater of the intake manifold for the LDS-465 engine. Fuel cleaned by filter (3) is delivered by pump (4) and goes through a special valve (11) along pipe (1) to nozzle (9), mounted in the intake manifold (2). The fuel is ignited by spark plug (8), connected with induction coil (7). Surplus fuel goes through line (10) to the fuel tank.

Operation of the preheating system is corrected electrically: coil (7) and the pump sensor are placed in a common electrical circuit through common "mass" clamp (6) and plug (5). Excess fuel from the nozzle goes along the discharge port into the piston cavity (12) and, pushing back the spring, flows into the tank. The nozzle intake valve and discharge valve open simultaneously under the effect of pressure created by a force pump.

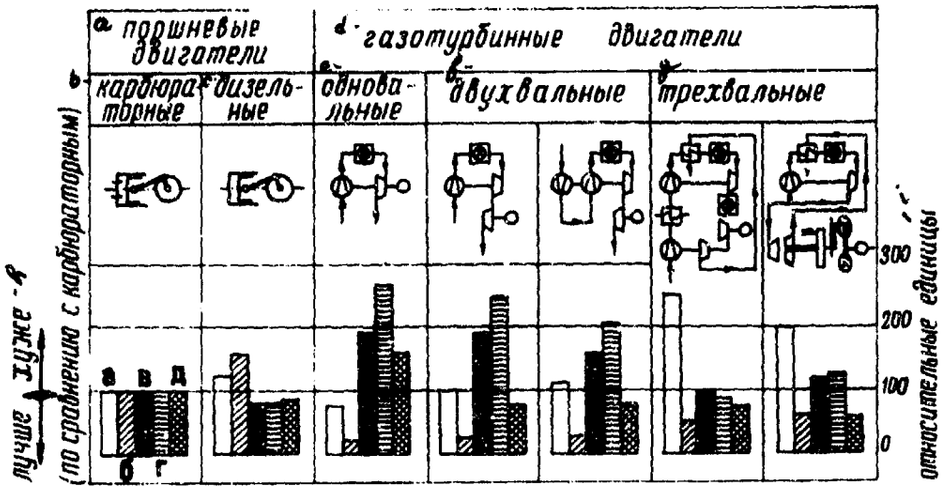
During the process of testing the preheater, the quantity of fuel was determined which must be injected into the manifold to ensure maximum heating of the air. In addition, it was established that the time for preheating a multifuel engine in the starting period is considerably reduced.

As before, much attention is being given to compensators which regulate the position of the control rack in the fuel pump depending on the density of the fuel. With zero pressure there is a maximum delivery of fuel and the engine starts easily. At low and high rpm, when there is a need for a different degree of compensation, the position of the control rack is corrected by the profile of the cotter connected with the fuel pump control rack.

Based on the experience of use of multifuel engines, specialists arrived at the conclusion that individual design elements needed additional work. Thus, they made a special port in the piston to cool its bottom. Oil under a certain pressure is delivered through the port. Oil-cooling of the piston, in addition, facilitates an even and gradual evaporation of the fuel and prevents its thermal decomposition and premature oxidation.

Fuel delivery system parts are also being modernized. The high-pressure pump, for example, is supplied with an injection advance coupling [mufta operezheniya vpryska]. By changing the angle of the pump shaft in relation to the control, it sets the initial angle of injection advance. The sealing surfaces of the nozzles are being made conical. The director needle of the injector spray tip is placed in a zone removed from the combustion chamber, which prevents gum formation on the nozzle part.

The gas-turbine engine is a new type of internal combustion engine. It consists of a gas turbine, compressor, combustion chamber, and preheater (regenerator). The compressor takes in air from the atmosphere and compresses it. Passing through the preheater, where the compressed air is additionally heated by hot gases discharged from the turbine, it enters the combustion chamber. Liquid fuel is also delivered here through the nozzle by a pump. The gases forming as a result of fuel combustion are directed into the turbine nozzles, and then against the blades of a rotor, and the kinetic energy of the products of combustion is converted into mechanical energy. Due to the absence of reciprocally moving masses, the bearings do not experience shock pressures. This permits the engine to operate at high rpm. It means that the designers have the opportunity to create tank engines with high overall power which exceeds by several times the overall power of contemporary tank diesel engines.



KEY: a -- piston engines; b -- carburetor; c -- diesel; d -- gas-turbine engines; e -- one-shaft; f -- two-shaft; g -- three-shaft; h -- better-worse (compared to carburetor type); i -- relative units.

The relative efficiency of GTD [gazoturbinnyy dvigatel'; gas-turbine engine] shown against the various schemes of carburetor and diesel engines, and also other characteristics: a -- cost of production; b -- weight; v -- specific expenditure of fuel; g -- engine braking efficiency; d -- response.

These data show that as the GTD develops and their schemes become more complex, the specific fuel expenditure decreases. In the latest models of the engines it has practically reached the level of carburetor models, but gives way to diesel. The weight and cost of the GTD increased at the same time. Nevertheless it is belived that, in spite of a higher production cost and less efficiency, the overall expenditures for the entire period of operation of tanks using GTD could be no higher, and for transport vehicles could even be lower, than for vehicles with piston engines. The overall efficiency of multishaft GTD installed in combat vehicles is also ensured by the fact that under combat conditions 40 percent of the time the engine will be operating on no load, 40 percent on partial load, and only 20 percent with full load. By making the design of gas-turbine engines with multiple shafts more complex, they successfully increased the response and provided engine braking by mechanically connecting two steps of the compressor with the output shaft.

Gas-turbine engines are attracting the attention of foreign designers also because they start easily in low temperatures without preliminary preheating and do not require a long warm-up. In just a few minutes they are ready to take any load. This is of great importance for a tank.

In modifying gasturbine engines, the specialists found a number of essential deficiencies in them -- low efficiency, high specific fuel expenditure. In addition, the high inertia of rotating masses limit the opportunity for using the engine for braking. This, as we know, considerably complicates driving. By making the designs more complex, these deficiencies were partially eliminated. Thus, to increase the efficiency of the gasturbine engine, there has been an increase in temperature of gases before reaching the turbine, and special heat exchangers have been installed which have a high degree of regeneration.

In order to raise the temperature of gases it is necessary either to gain a sufficiently efficient cooling of the turbine blades -- which is hard to do because of their small size -- or create a new and more heat-resistant material for the blades. For now there no reassuring results in the resolution of these problems. As regards the highly effective heat exchangers, they are already being installed in all transport-type engines.

The most promising type is considered the rotating heat exchanger with matrices of synthetic material. The sections of these matrices are heated to 600 degrees Centigrade. The honeycomb structure of glassceramic provides for a small heat expansion factor. It should be noted that the seals are the weak elements of rotating heat exchangers of all types.

In analyzing the designs of gasturbine engines, specialists came to the conclusion that their indicators could be improved considerably by introducing new materials. Thus they believe that metals must give way in the designs of heat exchangers to ceramics or other heat-resistant materials with a small heat expansion factor. They are also striving to use ceramic material in the seals which are an important design element of rotating heat exchangers. To ensure a constant clearance and creation of more favorable conditions for the operation of sealing devices, the part of the heat exchanger stator connected with the rotor is made from analogous ceramic material. In addition, steps are taken directed toward reducing deformation of other stator elements, which they are subjected to under the effect of temperature and mechanical loads.

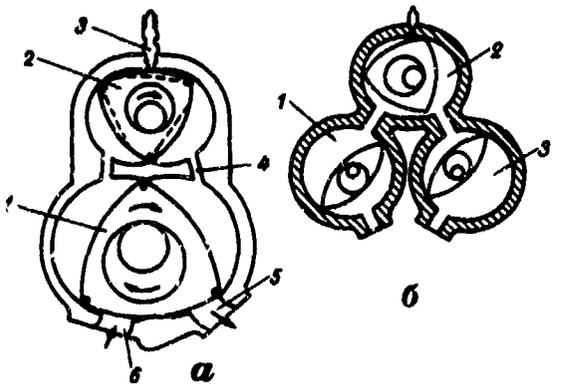
In the opinion of the specialists, the designs of seal plate springs meet practically all the demands, but they are too costly due to the complex production technology. They were not successful in replacing them with less costly hollow spring seals of various profiles, inasmuch as they were less elastic. Therefore they believe that the use of a bellows type seal might be a compromise solution with large changes in the size of the space being sealed.

Much work is being done to seek methods of cooling sealing devices. The idea of cooling them with a working liquid delivered from the driving hydromotor is considered promising. This problem became pressing in connection with the appearance of liquids permitting heating to 500 degrees Centigrade. They are trying to cool the rotor and stator surfaces which come in contact with it by means of air delivered by the main compressor.

A pressure head is used for reliable operation of the sealing devices and for reduction of the wear and thickness of the oxide coating of metal surfaces. However, the problem of a seal with a sufficient life has not been completely solved. Research in this direction continues.

No less attention is being given to developing reliable mechanisms ensuring stable operation of the drives of heat exchange rotors.

Work to create a gas-turbine engine for a tank is going on intensively. We know of the plans for an engine with a relatively low unit expenditure of fuel, achieved thanks to an increase in efficiency of compressors and turbines, and also by a reduction in loss of air pressure in the gas-air tract. Attempts are being made to use some models of gas-turbine engines in tanks as auxiliary power plants.



The diagram shows the scheme of rotary multibank multifuel engines which can be used as tank power plants. In the two-stage engine (a) rotor (1) of the first stage (low pressure) is connected by gear and pinion with small rotor (2) of the second stage (high pressure). Therefore, they rotate with identical speed in one direction with phase shift of 180 degrees. Air coming from the inlet port (6) into the low-pressure cavity is compressed and sent under pressure into the high pressure cavity, where fuel nozzle (3) injects portion of fuel into the compressed hot air. The working mixture ignites, and expanding gases force the small rotor to turn. The power stroke of the small rotor continues until its face opens exhaust port (4). The compressed gases go along this channel into the first stage (from the back side of the rotor) and transfer accumulated energy to the rotor. This happens until the rotor face opens the exhaust hole (5), after which the spent gases are discharged into the atmosphere.

Several sections of the two-bank engine can be assembled into one unit. As shown, two connected sections provide sufficient power, and their volume is 30 percent less that that of a contemporary diesel engine.

In two-stage engine (b) with two low-pressure rotors and one high-pressure rotor, the operating principle is different. From the pressure stage cavity (1) the rotor sends air into high-pressure cavity (2). After passing through it, the air transmits stored up energy to the rotor situated in the low pressure chamber (3), after which is is discharged into the atmosphere.

Beginning in 1958 the attention of foreign specialists was directed to rotary engines. In comparison with piston engines, they possess a number of advantages: their power per liter of displacement is two to three times greater, overall power is three to four times greater, and specific weight is 1½-2 times less. An even broader possibility appears in the construction of power banks with 85-90 percent unitized parts.

Many firms have produced several test models in metal. The most promising one was a rotary engine with a single-value movement of the rotor at constant angular speed and with fixed sealing elements -- the so-called "Wankel engine." But inasmuch as it is designed for gasoline, which has not been used for a long time as fuel for tank power plants, test and design work is going on in order to ensure its reliable operation with different fuels and fuel mixtures. In addition, attempts are being made to increase the peripheral speed of the rotor, find the most favorable shape of combustion chamber, and reduce the perimeter of the seals. There are attempts to increase the degree of compression. This has been achieved to some degree, but by complicating the engine's design -- the combustion chambers are placed one atop the other. The rotors -- rotating pistons -- are of different diameters. The lower, large rotor works as a compressor and decompressor of the main combustion chamber. The small rotor is placed in this chamber. The test model of an engine with such a design gave encouraging results. However, in spite of the broad front of scientific research, those abroad believe that rotary engines still remain far from perfect and will hardly be used in the visible future for tanks as the main engine.

ROTATING CONTACT DEVICE

Engr-Col V. Tikhomirov

The electrical power to consumers located in tank turrets is provided through a rotating contact device (VKU).

The only VKU-27 was not able to support the necessary number of circuits involving considerable current loads with an increase in the number and capacity of consumers. In addition, the electrical circuits serving automatic control and communications systems are not protected from interference.

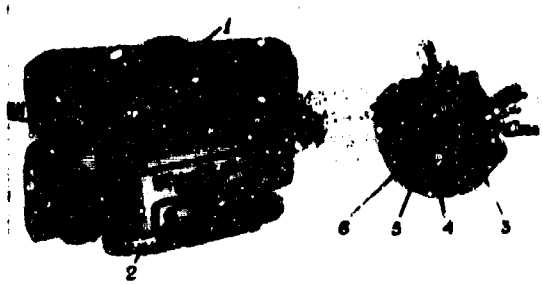


Fig. 1. Overall view of rotating contact device VKU-330-1: 1 -- upper (moving) body; 2 -- lower (fixed) body; 3 -- contact ring packet; 4 -- signalling half-ring contact; 5 -- cursor; 6 -- ferromagnetic shield.

At the present time a more improved design of the rotating contact device has been created. It uses "ring-ring" contact pairs to transmit electrical energy. In particular, the new VKU-330-1 (Fig. 1) allows the connection of 33 electrical circuits. Of these circuits, one between power sockets Sh1 and Sh5 is designed for 360 amp current (with brief overloads up to 500 amps possible), two circuits between sockets Sh4 and Sh8 transmit currents

up to 30 amps and can stand overload up to 80 amps. Six circuits are designed for transmission of dc control signals without distortion (connectors 1-6 in sockets Sh2 and Sh6). All of them are shielded with a special ferromagnetic shield and designed for currents up to 5 amps. Four circuits (connectors 11-14 in sockets Sh3 and Sh7) are shielded by use of grounded rotating rings and serve to transmit ac from the converters. All other circuits are designed for nominal 5 amp currents.

The VKU contact system does not have rings and brushes in their usual form. Contact between two elements rotating in relation to one another (Fig. 2) is accomplished by a multipoint contact of one conducting part with another.

Fig. 2. VKU conducting element: 1 -- fixed contact ring; 2 -- movable ring; 3 -- insulating disk; 4 -- conducting gasket.

The fixed contact ring (1) of the conducting element is made of sheet cadmium bronze. Its inner teeth (simple contacts) are curved toward the movable ring, and have a certain elasticity which improves the electrical contact between rings. To ensure a large contact surface and increase the life of the first ring the contact radius is made to vary -- the ends of the teeth are placed in an Archimedean spiral, with the boginning of the involute exceeding the end by 1.6 mm. Current is sent to the fixed ring by means of gasket (4) by welding a wire to its outer projection.

Movable ring (2), made of cadmium bronze, is glued to insulating disk (3) and connected with the VKU driving shaft by three slots on the internal diameter of the disks. A conducting wire is welded to the inner projection of the ring.

All contact elements are assembled into one packet and tightened by pins. In the lower part of the packet are contacts which signal when the gun moves beyond the tank body [gabarit]. They are in the form of bronze half-rings mounted on a fixed insulating sheet. The cursor is connected with the drive shaft and remains on the insulator until the gun moves beyond the tank body. If this happens, the cursor touches one of the half-rings and turns on the corresponding signal light on the driver-mechanic's panel. The signalling circuit is shorted across contacts 14 and 16 in sockets Sh4 and Sh8.

VKU-330-1 is hermetically sealed and secured to the bottom of the tank with three bolts. Its circuit leads are also hermetically sealed plug sockets. The upper part of the body is connected with the tank turret by a conduit [povodkovaya truba] in which wires leading from the VKU are placed.

SCHOOL INNOVATORS

Engr-Maj O. Mashchenko

Inspired by decisions of the 24th CPSU Congress, inventors and rationalizers of the Kiev Twice Red-Banner Higher Military Engineer Communications School stepped up their activity. In the first half of 1971 alone they submitted one claim for a discovery and 44 for prospective inventions, and they developed 159 rationalizers' proposals. During this time school inventors received 15 authors' certificates and three decisions for their issue.

It is not only the professor-instructor and engineer-technical personnel, but also students of the senior courses who engage in inventive and rationalizing work. For example, in a half year student graduates submitted 16 claims for inventions and made 40 rationalizers' proposals. Col P. Usik, Engr-Maj V. Kiselev, Engr-Lt P. Ivashchenko, and Soviet Army employees A. Potishko and I. Zavalin are the authors of many technical innovations.

The creative activity of school personnel is directed toward fulfilling topical assignments of the command. Innovators have, in particular, developed equipment for three training classrooms which has received high praise. The three most valuable instruments were exhibited at VDNKh [Vystavka dostizheniy narodnogo khozyaystvo SSSR; Exhibition of Achievements of the USSR National Economy], and ten at oblast and republic exhibits of DOSAAF [Dobrovol'noye obshchestvo sodeystviya armii, aviatsii i flotu; Voluntary Society for Cooperation with the Army, Air Force, and Navy].

The command and political department of the school devote much attention to innovative and inventive work and take constant interest in the work of the inventions commission, which includes the most experienced specialists who are quite familiar with the fundamentals of invention and patent law. The commission secretary completed the Central Institute for Workers and Specialists of the National Economy in the field of patent work and has a patent specialist's diploma.

The podrazdeleniya regularly hold classes on the fundamentals of patent work. Supernumerary patent specialists regularly follow patent literature (on "information days" they study the patent stacks of the republic

library and school library), help authors draw up claims for inventions, and check them for patent possibility.

It must be said that this serious attitude toward patent work had a positive effect on inventive and innovative work. The school has noticeably increased the level of technical creativity and the number of inventions.

FOR TAKEOFF AND LANDING

Engr-Lt Col S. Lazarevich

The development of contemporary aircraft, characterized by a continuous increase in their maximum speed, is achieved by a constant improvement of their aerodynamic forms and by an increase in thrust-to-weight ratio.

However, improvement in the speed characteristics usually involves a worsening of takeoff and landing characteristics. The length of takeoff and landing runs increases. As a result there is a need to increase the size of takeoff and landing strips (VPP). In order to improve takeoff and landing characteristics it is necessary to reduce the liftoff and landing speed of an aircraft. This is usually achieved by mechanizing the wing, i.e., by employing special devices which increase its lift.

We know that the lift coefficient C_y depends on the camber and profile thickness of the wing and the value of the angle of attack (Fig. 1). For

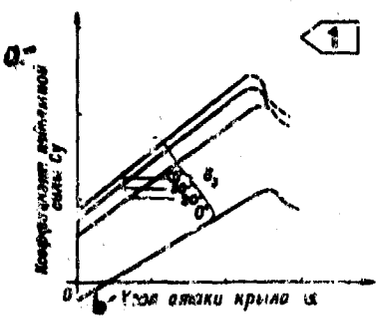


Fig. 1. Relationship of the wing lift coefficient to the flap angle. KEY: a -- lift coefficient; b -- wing angle of attack α.

thin, short wings of supersonic aircraft this coefficient is considerably less than for the usual (thick) wings employed on subsonic aircraft. The fact is

that a thin wing is calculated to achieve a given maximum speed, at which speed the flight takes place at low C_y. To obtain the required C_y coefficient at liftoff (or during landing), it is necessary to take off or land at large angles of attack which are close to the critical value which, if exceeded, gives rise to a breakup of the flow from the wing.

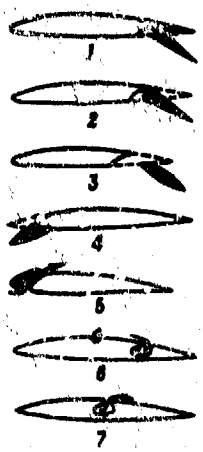


Fig. 2. Basic types of wing mechanization 1 -- extension flap; 2 -- slotted flap; 3 -- extension flap; 4 -- leading edge flap; 5 -- slat; 6 -- drawing-off boundary layer; 7 -- boundary layer blowing.

Usually wing mechanization (Fig. 2) reduces to changing its camber at specific stages of the flight. The most widespread means of mechanization is an extension flap. This is the rear part of the wing which, if necessary, moves down and to the rear. As a result of increasing the profile camber there is an increase in air pressure on the lower part of the wing and a decrease on the upper part. The lift increases because of this. This increase in lifting surface of the wing provides an additional increase in lift. Flow-over of a part of the air from the lower wing surface, where pressure is greater, to the upper surface through the slot between the flap and the fixed part creates a stream of air which draws with it the retarded boundary layer and improves the flow around the wing. As a result, there is an even greater rise in its lift.

The greatest effectiveness of extension flaps is achieved when the angle of inclination is 40-45 degrees. This is the angle at which they usually are set during landing, when, in addition to a great deal of lift, there is a need for considerable head resistance. During takeoff the flaps are usually set at the least angle, since at a large angle the aircraft accelerates slowly and length of run increases due to an increase in aerodynamic resistance. Use of slotted extension flaps permits a considerable reduction in the aircraft's speed of liftoff and landing, and consequently a reduction in the length of its takeoff and landing run.

Another means of mechanization are leading-edge slats -- small surfaces placed along the leading edge of the wing. During flight at small angles of attack, the oncoming flow presses them to the wing and they adjust to the shape of the wing. At large angles of attack, the slats automatically move out away from the wing due to rarefaction of air above them. A stream of air flows into the slot formed and blows the boundary layer from the upper part of the wing. As a result, the C_y factor increases. The greatest effectiveness of the leading-edge slats is achieved when they are placed along the entire extension of the wing. They are often placed only opposite the ailerons to increase their effectiveness.

The type of mechanization such as leading edge flaps are usually used on thin wings with a sharp leading edge. With the flap not inclined at large angles of attack, the air stream breaks up behind the wing and consequently the lift decreases. In case the flap is lowered, it is placed approximately

in accordance with the flow and flow around the wing improves. In addition, the C_y coefficient increases due to an increase in profile camber.

Use of a leading-edge flap placed, usually, at the end of the wing, together with trailing-edge flaps, increases the lift coefficient by about double.

A flow interruptor or, as it is called, an interceptor, is a flat sheet placed in the trailing edge of the wing along its entire length. In its nonoperating position, the sheet is recessed and does not extend beyond the outer contours. When it is lowered from the wing the incoming stream of air, on encountering it, is retarded. This increases the difference in pressures below and above the wing. As a result, there is an increase in the C_y coefficient and the lift. The rarefaction of air forming behind the interceptor improves the flow-around and increases the wing lift.

Boundary layer control (UPS) is a very effective means of mechanization. It is performed by blowing off or drawing off the boundary layer from the upper wing surface when flying at large angles of attack. As a result, the difference in pressures below and above the wing increases, and thus lift grows.

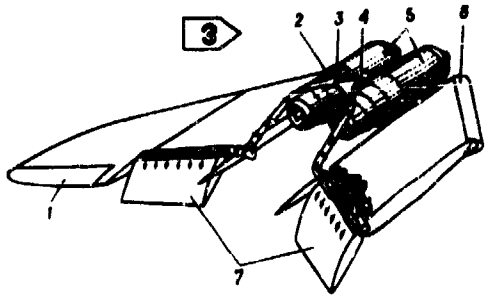


Fig. 3. System for bleeding air from compressors of turbojet engines for blowing off the boundary layer in front of the flaps: 1 -- aileron; 2 -- collector; 3 -- connecting duct; 4 -- valve; 5 -- engines; 6 -- leading-edge flap; 7 -- flaps.

Several slots are usually provided for drawing or blowing off the boundary layer in the upper part of the wing in places of greatest retardation of the air stream. In drawing off the boundary layer (OPS), the air is discharged into the atmosphere or delivered to the intake port of the aviation engine through a system of lines and with the aid of pumps (or compressors). The blow-off of the boundary layer (SPS) is done by air forced by the engine compressor (Fig. 3). Use of SPS in combination with flaps provides particularly good results.

The essence of action of an element of wing mechanization such as a jet flap is based on a powerful stream of gases from the engine discharged

through a narrow slot placed along the wing's trailing edge, at an angle to the oncoming stream of atmospheric air. This changes the character of flow around the wing: the flap's discharged stream draws in the surrounding air and increases its circulation, as a result of which additional lift occurs. In addition, lift increases due to a vertical component reaction of the discharged stream of gas.

The effectiveness of a jet flap is determined by the angle of inclination of the stream and the amount of reactive force, which depends on the expenditure of gas per second through the slot and its discharge velocity. Using a jet flap it is possible to obtain an increase in C_y several times greater than with an ordinary flap. This will allow more than halving the take-off run of the aircraft.

Inasmuch as the jet flap ceases to operate when the engine stops, and thus the aircraft is deprived of means of mechanization, it is necessary to have one more (supplementary) means of mechanization.

In recent years, changing the sweep of the wing in flight has received great use in supersonic aircraft. Using special mechanisms, the entire wing or a part of it, as if adjusting to the flight regime, turns so that the aircraft has the most favorable aerodynamic characteristics through the range of altitudes and speeds. During takeoff and landing a minimum sweep is set at which the supporting power of the wing increases. Here there is a considerable increase in effectiveness of flaps, and in the final result there is a decrease in length of takeoff and landing.

It is also possible to reduce the length of takeoff and landing runs by briefly increasing the engine's thrust. The greater the thrust, the faster the aircraft accelerates to the speed at which a lift is created sufficient for it to leave the ground. Therefore certain aviation turbojet engines (TRD) can operate for the short time needed for takeoff at a takeoff regime which somewhat exceeds the thrust of the permissible nominal regime. Many TRD have afterburners which permit a considerable increase in engine thrust by supplementary ignition of fuel after the turbine and among the discharging gases. Although the fuel expenditure sharply increases during the time the afterburners are on, there is a substantial decrease in the aircraft's takeoff run.

Launching boosters are another very effective means for accelerating an aircraft on takeoff. These are small and lightweight jet engines which usually operate on solid fuel and which are capable of briefly developing a great thrust. Thanks to this, the aircraft's thrust to weight ratio on takeoff increases considerably.

Such boosters are hung under the wing or fuselage on special mounts. After their operation ceases, they are usually released to drop to earth. One good thing about the boosters is that their use is not involved with fuel expenditure from the aircraft tanks. As regards a drawback of boosters such as one-time use, it is justified by the light weight and simple method of mounting them on the aircraft.

Acceleration during a takeoff run can also be increased by various devices on the ground, part of airfield equipment. Catapults, which have found use for shortening the takeoff distance of aircraft, are a rather effective means for acceleration.

Air brake flaps mounted on the fuselage or wing are employed for damping the aircraft's kinetic energy built up in flight, in addition to use of chassis brake wheels. Inclination of the flaps increases the head resistance and decreases the aircraft's speed. In their retracted position, the air brakes do not extend beyond the outer lines of the fuselage or wing, and create no additional drag.

At high landing speeds of modern aircraft, the traditional means of braking cannot successfully cut aircraft speed on a relatively small VPP [vzletno-posadochnaya ploshchadka; takeoff and landing strip]. Therefore a brake parachute is used in addition. There has been widespread use of a ribbon-type chute consisting of a canopy with shroud lines, cover, pilot chute, coupling link, and pack.

The canopy and shrouds make up the main part of the parachute. The majority of fighter aircraft employ parachutes with a canopy 3-5.5 meters in diameter, and those for bombers are 8-13 meters (if single) or 5-7 meters (if there are several). Silk and synthetic fabrics (nylon, perlon, capron, and others) are used as material.

Shrouds are made of round cord or belts. The parachute canopy and shrouds are attached to the aircraft by means of the coupling link and are packed into the cover, which when released regulates the opening of the chute. The pilot chute serves to pull the canopy from its container and the coupling link and shrouds from the cover and to drag the cover from the canopy. The brake chute together with the pilot chute is assembled in a container which is usually placed in the tail section of the aircraft fuselage.

After the aircraft wheels touch the VPP surface, the pilot presses the button to release the chute, thus opening the doors of the container hatch. The pilot chute emerges into the air stream, drawing after it the cover, which it drags from the canopy and pulls out the coupling link and brake chute canopy.

The brake chute has considerable advantages over other braking means. With a light weight and small size when packed, it forms a considerable area of resistance when released. A high braking factor is achieved regardless of the condition of the VPP and, more important, it occurs in the initial stage of the landing run, when wheel braking is not very effective. Use of a parachute eases the work of the wheels, and thus there is an increase in tire life.

Engine thrust reverse allows a considerable reduction in the landing run. This principle of action is based on a change in the direction of the

engine thrust vector. With turboprop engines, the reverse is usually achieved by turning the blades of the propeller, and with turbojet engines by turning the stream of gases emerging from the jet nozzle.

Thrust reverse systems are quite varied, both in principle of diverting the stream and in design. The gas stream can be diverted either before or after the jet nozzle. The gases emerge either in the form of two strong streams or as numerous small streams evenly distributed around the perimeter of the exhaust system cross-section.

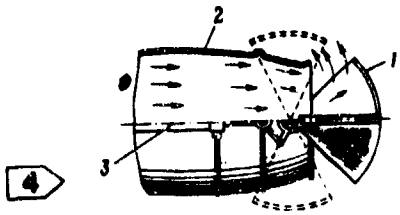


Fig. 4. Two-flap reversing device: 1 -- flaps; 2 -- engine exhaust nozzle; 3 -- hydraulic cylinder.

The two-flap reversing device (Fig. 4), which diverts the stream of gases after the jet nozzle, has flaps which assume a horizontal position after the reverse is switched on. In this case the emerging gases come into contact with the flaps and sharply change the trajectory of movement, as a result of which there is a change in the direction of the thrust vector. A so-called negative thrust arises which brakes the aircraft's movement and does not depend either on the condition of the VPP or on the speed and direction of the wind. This is an advantage over other means of braking.

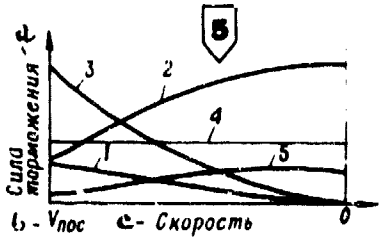


Fig. 5. Effectiveness of various braking means on landing: 1 -- brake flaps; 2 -- wheel brakes (on a dry VPP); 3 -- brake chute; 4 -- thrust reverse; 5 -- wheel brakes (on icy VPP); a -- braking force; b -- $V_{landing}$; c -- speed.

As is evident from the chart (Fig. 5), joint use of thrust reverse and wheel brakes ensures effective aircraft braking on the landing run right up to

a complete stop. Even at the moment the aircraft stops, the wheel brakes and thrust reverse possess braking force sufficient to hold the aircraft in place if outer forces are acting on it. At the same time, the braking force of a parachute and flaps together under these conditions is practically non-existent.

CONCRETE-PIERCING PROJECTILE

Unattributed

With the appearance of reinforced concrete field structures, the need arose for a new type of projectile which could successfully demolish them. Such projectiles, which were given the name "concrete-piercing," were developed in the thirties by Soviet military engineers, and in particular by V. Ya. Matyushkin-Labuzinskiy.

In contrast to a high-explosive of the same caliber, the body of a concrete-piercing projectile has a thicker wall. It is fitted with base fuses set for blast or delayed effect. A projectile on which the fuse is set for delayed action penetrates for a certain depth into any obstacle encountered, and then bursts.

The experience of the Great Patriotic War showed that Soviet concrete-piercing projectiles are distinguished by their great power.

METHODOLOGICAL SKILLS FOR STUDENTS

Engr-Col A. Tarasov

In addition to a profound theoretical knowledge and specific skills in independent operation of equipment, future engineers have an absolute need for good organizational and methodological skills for successful work in troop units.

Our experience confirms that practical training in departments engaged in technological, repair, and operational training greatly facilitates the formation of an organizer and methodologist. In particular, we in the department of technology and repair primarily use for such aims technological practice in test training repair shops (uchebno-opytnyye masterskiye - UOM), laboratory repair practice, and practice at repair enterprises.

Practice in the UOM is done in the junior courses. During this time the students master the technological processes of processing materials used in the manufacture and repair of combat equipment. We bring in a part of the students (20-30 percent of the total number) as instructors for one or two working days in separate production sectors (metal crafts, welding, electrical, etc.). The instructor checks the readiness of the work areas for classes (to see that they are supplied with working equipment, technological and control measuring instruments, graphic aids, and technological documentation. During the classes, the instructor explains to each trainee the construction and operating rules of the equipment and tools, demonstrates the techniques for processing the materials, familiarizes the trainees with safety measures, and supervises their fulfillment. He also organizes the clean-up of the work areas at the end of the classes, maintains discipline, and ensures fulfillment of the daily routine. The work of the on-the-job-training instructor is evaluated according to a four-ball system and is subject to thorough critique.

Of course, an instructor can handle the duties imposed only if he is himself very familiar with the range of questions set forth above, and if he has specific skills in handling equipment and tools.

Before such practice we hold training methods sessions with the student-instructors, first in the classroom and then at the work areas in the UOM. The instructor, who is responsible for overall guidance, states the goal and content of the practice, explains the role and tasks of the instructors, sets forth the organization and methodology of their preparation for performing their duties, places them in groups according to specialties, and gives them over to the teachers responsible for the practice in specific production sectors. The latter explain the features of work in the given sector, state the plan for conducting classes and preparations for them, establish the range of problems to be resolved by each instructor, give concrete assignments for independent preparation, and recommend literature.

At the work areas the student-instructors, under the guidance of the teachers and assigned instructors master the equipment of the work areas and practice the skills of performing particular operations. Preparations are concluded with the compilation of a synopsis or detailed plan for conducting classes at the work area. This is approved by the teacher after a preliminary check of the student's knowledge.

Obviously, the student-instructors receive certain organizational and methodological skills in the process of preparation and in the practice itself. Laboratory repair practice serves as the next step on this path. It is conducted in the senior courses and has the goal of firming up and deepening the theoretical knowledge obtained in studying the questions of operation and repair of equipment, instilling practical skills of determining the condition of equipment coming in for repair, and teaching precise execution of technological operations, supervision of quality of restoration of parts and assemblies, development and use of technical documentation. There is a definite stress on the goal of giving the students an opportunity to acquire experience in organizing and managing repair work.

The complete independence of students is provided in the course of the practice. Permanent teams are created, with commanders who change periodically. In the course of the practice, each student performs this duty at least once.

The team chief is subordinate to the teacher or instructor and is the immediate supervisor of team personnel. He has the responsibility for organization and quality of training of subordinates for the forthcoming work.

Before the beginning of laboratory work, an instructional-methodological conference is held to inform the students on all questions relating to organization and methodology of the work. They are reminded of the rights and duties of team commanders, and are shown the guiding documentation.

Independent preparation is held for the commanders on the eve of the classes. They receive the work areas and check the presence and working order of equipment and tools. Together with the assigned instructor, they take care of shortcomings discovered and check the presence of appropriate documentation.

At the beginning of the class, the commander distributes work among team members, coordinates their actions, and ensures correctness in fulfilling

technological processes and technical conditions for repair, and correctness in using technological equipment.

When the practical work has been accomplished and technical documentation has been filled out (log of laboratory work), the team commander organizes the clean-up of the work areas and putting the equipment into working order. Then he reports to the teacher or instructor the accomplishment of the task assigned for the day and together with him conducts a critique of the class. The critique evaluates the work of the team as a whole and each student in particular. Particular attention is given to organizational questions. Work of the team commander as the work organizer is discussed not only by the class leader, but by all team personnel. This makes it possible for those students who will subsequently be in this role to avoid errors. Each is given a mark for performance of duties of team commander.

These methods give positive results if there is a good training laboratory which allows all students to take an active part in practical classes, if the guiding documentation strictly defines the scope, content, and procedure for performing the work, and if the classes are conducted by trained instructors.

Practice in repair enterprises is done at the end of the training process. Here the students receive on-the-job-training (OJT) in engineer-technical duties and acquire organizational and methodological skills. Their work is supervised by those chiefs whose functions they are performing. The instructor gives the OJT man a specific work sector in which he is to handle all questions involving organization and support of the repair process, improvement of old and development and adoption of new technological processes, improvement of equipment and gear, compilation of technological documentation, and training of personnel. Together with the instructor, the student draws up a plan for OJT in the duty. The plan shows the sequence of practical study of the technological processes of repair and of guiding documentation, the performance of an individual assignment, and resolution of questions involving performance of functional duties (conducting classes and lectures, working out technical solutions, etc.).

The man on OJT takes part in social-political, training-educational, and rationalizing work. He makes independent decisions in all questions and reports them to the instructor. Only after he receives approval does he put them into effect.

The instructor reflects the student's initiative, his degree of independence, scientific and technical competence of decisions, organizational capabilities and methodological skills, participation in sociopolitical life and training-educational work, and other aspects of his activities, in an official comment which he writes on each student.

A quiz is held at the work areas by a commission made up of school representatives, heads of the repair enterprise, and definitely the immediate supervisor of the student. In the course of the quiz the commission checks the objectivity of the response. An overall evaluation of practice

is given not so much for knowledge of theory and technological repair processes, as for the ability to employ this knowledge in practice. This method of giving quizzes forces consideration of the demands of practice and permits a more reliable evaluation of the degree of preparation of future military engineers for practical work in troop units, as well as of the quality of supervision of practical work on the part of the engineer-technical personnel of the repair enterprise.

Successful solution of the tasks before the men on OJT depends on many factors, and particularly on how well they, and especially their supervisors, understand the tasks and methodology of conducting practical work. The goals, tasks, organization, and methodology of performing practical work are set forth in the training schedule and guiding training-methods documentation developed in the department. The fundamental provisions of these documents are made known to the students and their immediate supervisors at production conferences held before the beginning of practical work. The realization of the basic provisions of the guiding documentation and establishment of businesslike relations between the men on OJT and their immediate supervisors are facilitated by regular checks of the course of practical work by school representatives, with subsequent discussion of the results of the check at production conferences.

A critique is held to discuss results of practical work and of the work performed, to encourage the best OJT personnel and supervisors, and for an exchange of opinions between OJT students and the supervisors of the repair enterprise on questions of improving the repair production process and the organization and methodology of such practical work.

Such an organization of practical work considerably increases the responsibility of students, and especially of their immediate supervisors, for the quality of schedule fulfillment. Thanks to this, we have the best conditions for students to acquire organizational and methodological skills.

SMOKELESS POWDER IN RUSSIA

Val. Mavrodin

Smokeless powder replaced black powder in Russia when the S. I. Mosin rifle with its encased bullet was adopted by the Russian Army in 1891. However, Russian gunsmiths had carried out tests with smokeless powder a half century before the appearance of this rifle. In the forties and fifties of the nineteenth century in Russia it was called "missile cotton," "fire cotton," "wadded powder," or "pyroxyl" ("pyroxyline").

A well known physicist, powder expert, and gunsmith, Col A. A. Fadeyev made his "wadded powder" for the first time in Russia in 1841. This he hoped to replace with a cheaper material. Later he obtained a specimen of "granulated pyroxyl," but this had an essential shortcoming -- it self-ignited, which made it very dangerous as a projectile substance. A. A. Fadeyev considered "pyroxyl" a prospective projectile substance, and strived to rid it of this property through granulation. In his opinion, by increasing the density of the granules this would eliminate the possibility of the barrel bursting. And although the "fire cotton" still could not replace black powder and handling it was not without danger, Fadeyev rightfully believed that in time either it or a substance like it would replace black powder.

Tests with the "fire cotton," the precursor of smokeless powder, were not only performed by Fadeyev in Russia. In 1846 Turbin proposed his method of manufacturing it. In these same years there began the production of "fire cotton" in Peterburg at the Okhtenskiy Powder Plant, in Yur'yev (Derpet, Tartu), and in Moscow.

In Yur'yev Professor Gebel' was manufacturing "fire cotton" according to his method, while in Moscow a university laboratory assistant named Shmidt was doing the same. The Okhtenskiy Plant was using the Knop method. The "projectile cotton" of the Okhtenskiy Plant received a high evaluation and was acknowledged as best.

As noted in the appropriate documents, the new projectile substance produced almost no smoke when fired. This made it possible to see the target and not give oneself away. In the ignition process it developed a low

temperature, possessed a small specific weight, and with a relatively small amount of charge had great power in comparison with black powder. In addition, the "projectile fire cotton" used as a charge caused less of a recoil on firing, formed a small deposit in the barrel, and was not so much affected by dampness as black powder. If it did get damp, it fully retained its initial properties on being dried out. In addition, there were also shortcomings, primarily a sensitivity to compression, high cost of manufacture (six times higher than black powder), an abrupt increase in pressure on being fired, and a number of others.

A serious shortcoming of "fire cotton" was its ability to self-ignite. For this reason 81 pounds of "projectile cotton" blew up at the Okhtenskiy Powder Plant on 12 November 1847. Subsequent tests performed at the plant at the end of 1847 and in 1848 permitted development of a method of storing it. True, they did not succeed in fully eliminating the danger of self-ignition.

Russian chemists and gunsmiths estimated the true worth of smokeless powder. They conducted successful test firings and set up production. But at that level of development of chemical production and powder manufacture they did not succeed in eliminating the deficiencies of "fire cotton." Only 40 years later, after D. I. Mendeleyev and I. M. Chel'tsov made their discoveries, did smokeless powder become the basic projectile substance used for firing from all types of firearms.

MEANS OF COMPLEX MECHANIZATION

Engr-Lt Col Ye. Aleksandrov

In our country over 240 million tons of various goods are processed daily. Taking into account the intraplant hoisting and transport work, this figure goes up to 350 million tons. Reduction of the time spent on performing these operations is one of the directions in accomplishing the task set by the 24th CPSU Congress for increasing the labor productivity and effectiveness of use of production capacities.

The Congress Directives on the five-year development plan for the USSR national economy for 1971-1975 provide for a considerable increase in output of means for mechanizing hoisting and transport, loading-unloading, and warehouse work. It is planned to produce hoisting-transport complexes of machinery with remote and automatic control, as well as cyclic machines for automated conveyor transport lines. There will be an expansion of production of special mechanisms and devices serving to reduce losses of free-flowing cargo during transport. There will be a higher level of complex mechanization of loading-unloading work on transport.

In light of these tasks, it is easy to understand the enormous interest aroused in visitors of VDNKh [Vystavka dostizheniy narodnogo khozyaystva SSSR; Exhibition of Achievements of the USSR National Economy] by the interbranch topical exhibit of means of complex mechanization and automation of transport, loading-unloading, and warehouse work. Its scale is indicated by the fact that displays were submitted by 10 union republics and 40 ministries and departments in the USSR. Over 800 new models of hoisting-transport equipment effectively used in various branches of the national economy were demonstrated in the pavilion and on several display areas.

Among the means designed for mechanizing auxiliary work in industry was a wide representation of new electric loaders with a capacity of 0.5-10.0 tons. A majority of them can operate both in a building and on open areas. They can operate in varying temperatures. For example, the EP-0601 and EP-501 electric loaders with a capacity of 0.63 and 5.0 tons respectively work faultlessly in temperatures from -40 to +40 degrees Centigrade. They are

outfitted with interchangeable equipment. An attention-getter is a hoist with a rotating-extending gripper fork. The test model, designed for the 2-ton EP-201A electric loader, was made by the Kolomna Mechanical Plant. The fork of the hoist rotates to both sides 90 degrees relative to the longitudinal axis of the loader. Using this, it is possible to decrease by almost half the distance between warehouse racks, and the capacity of the storehouses goes up 20-30 percent.

A large family of new vehicular loaders is led by the VP-25 with a capacity of 25 tons. Equipped with a fork lift, it raises the load 3.5 meters, and with a boom it can lift up to 5 meters. The speed of lifting a load is 4.8 meters/min, transport speed is 20 km/hr, and turning radius is 7.8 meters. Among the younger brothers of this stalwart is the Model 4075 universal lift truck with good cross-country ability and a capacity of five tons. The vehicle's 115 HP engine permits it to develop a transport speed of 55 km/hr. The loader is outfitted with hoists for lifting loads 2.8 or 4.5 meters. The loader's capabilities are considerably widened thanks to use of a large number of special load-gripping devices. Thus, the rotating PR11-5 tilter-carriage permits rotating the fork 270 degrees in the vertical plane. Carriages of another type provide for lateral movement of the fork to both sides for 75-200 mm, or for turning them 25 degrees in a horizontal plane (also to both sides). In addition, the machine can be equipped with a pulleyless boom with fixed or changeable extension, a bulldozer-grab bucket, and various types of grapples and clamps, including those with an upper clamp.

Where use of complex and costly hoist-transport means is uneconomical or impossible, wide use might be found for the hoist trolleys developed by the Ul'yanovsk Scientific-Research Design-Technological Institute of Machine Building (UNIPTIMASh). With their help it is possible to mechanize transport and loading operations in cramped warehouse areas, shops filled with equipment, within rail cars, i.e., where it is impossible to use electrical and truck lifts.

It is convenient to transport various articles and raise them to a height of one meter, such as when installing or mounting on machine tools, racks, or transport, with the aid of table trolleys, and to remove or mount engines of vehicles and tractors with crane trolleys of 250-1000 kg capacity. The latter have a U-shaped frame open on one side and a loading boom equipped with a hydraulic lift for manual operation. There is also a hydraulic drive on light stacker trolleys with extensible forks (capacities of 125, 250, and 500 kg, load lift heights of 1.5 and 1.8 meters).

The KB-160.2 radio-controlled crane is the fruit of joint work by collectives of VNIIStroydormash, Minstroydormash (Severyanin Plant), and the Kiev Automatic Equipment Plant. This is for loading-unloading and assembly operations during erection of tall structures. Control is by a radio transmitter. Twenty commands can be sent from the control panel. Work is provided in accordance with a given program. When necessary the crane is operated by two men: one is on the load platform, the other right at the assembly site.

The TGS-4 tracked transporter is designed for mechanization of many construction jobs. It is capable of transporting up to four tons of cargo under cross-country conditions, performing loading-unloading and earth-moving work, move heavy construction items or pull out stuck machinery. The vehicle is equipped with a partially rotating (200 degrees) crane with a capacity of 1.6 tons, bulldozer equipment (width of blade is 2.22 meters), and a winch developing a tractive effort of seven tons. The transporter's speed is 11 km/hr.

Taking out obstructions on land and on the water, sorting, transporting and transloading logs, clearing areas, and laying forest roads -- this is a far from complete list of operations which are successfully fulfilled by the family of highly efficient, reliable, and long-lasting machines displayed by the Onega Order of October Revolution Tractor Plant. The base vehicle of the family is the TDT-55 skidding tractor, many assemblies of which have been developed as inventions and are protected by authors' certificates. The perfection of design is also confirmed by the Gold Medal given to the machine at the 1970 Markkleesberg (GDR) Exhibition. The tractor is equipped with a tractive winch developing 7.25 tons of force, a hydraulically controlled loader, and bulldozer-type mounted equipment with a pusher. The tightening device of the drive wheel and an original suspension guarantee that the tread will adapt itself well to the road and preclude its slipping on weak ground. The average specific pressure on the ground is 0.43 kg/cm^2. The control organs are concentrated in a spacious cab with good all-around field of view. It is equipped with an adjustable seat. The machine's operation in the cold part of the year is eased thanks to prestart preheating of the fuel and engine.

Twelve authors' certificates protect the design of assemblies and units of the TB-1 tractor, which has a powerful mechanical "hand," raised over the machine's load platform. The rotating hinged-lever boom hydraulic manipulator with pincer grips lifts, drags, and loads logs weighing 1.3 tons. Tractive force on gripping, with the boom extended 3-3½ meters, is 2.1 tons. The grip can lift loads to 5.5 meters and lower them 0.7 meters below the supporting surface. The boom can turn 157 degrees. The maximum span of the grip is 80 cm. The machine permits increasing work productivity by 2.2 times and can be used in many branches of the economy.

A large part of the exhibit was taken up by displays demonstrating processes of mechanized and automated processing of cargoes at warehouses and market-supply bases. Adoption of automatic equipment permits fully precluding such laborious operations as delivery of loads to the stacker, placing them on racks, and transporting them to the allotted place. All work is performed by mechanisms which are controlled by one person from a central panel.

Bridge cranes with remote control, automatic conveyer reloaders, aerial and underground pushing conveyors of various types, including those with automatic load address, and a multitude of other mechanisms shown in action, graphically illustrate the progress already achieved today in resolving problems of complex mechanization of production processes.

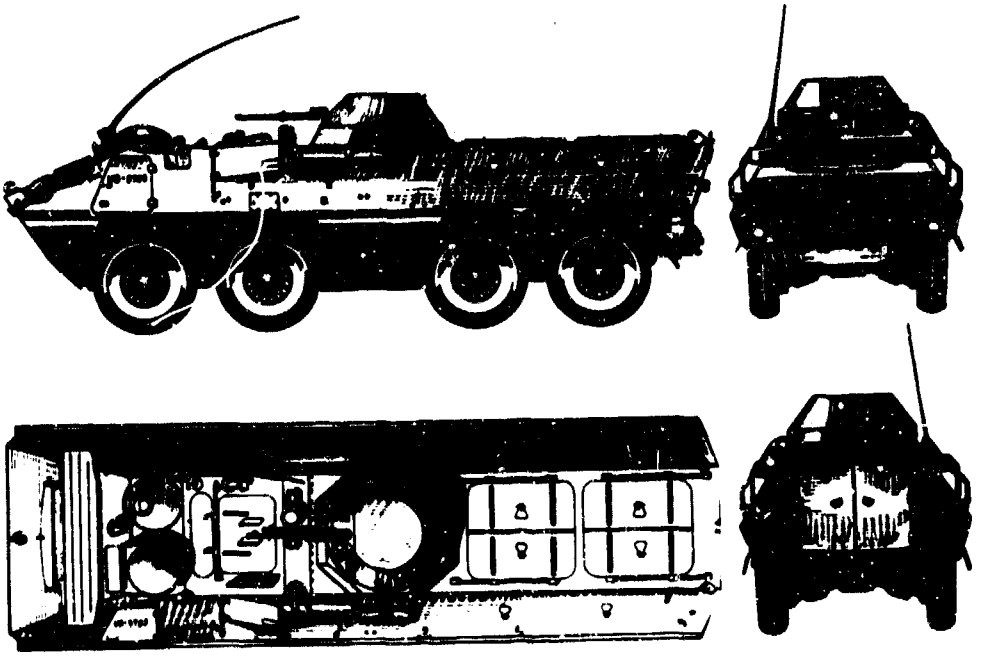
"SKOT" ARMORED PERSONNEL CARRIER

Yanush Magnuski

A four-axle, eight-wheel-drive amphibious APC is in its first year of service with the fraternal Czechoslovakian People's Army and the Polish Army. Czech and Polish designers contributed their labor to the creation and improvement of this combat vehicle. At present the APC is being produced by the industries of both countries. Thus was expressed the concern of the governments of Poland and Czechoslovakia for steadily strengthening the combat might of the armed forces of member countries in the Warsaw Pact.

Just what are the performance characteristics of this APC, which is put out in Poland under the designation SKOT-2AR?

The machine weighs 12.8 tons, has a length of 744 cm, a width of 250 cm, and a height of 271 cm. Armor protects the crew and the assault party from small arms and machine-gun fire and from fragments of shells, mortar rounds, and grenades. Protection is provided against radioactive contamination and the effects of toxic combat substances by sealing the body and employing a filter-ventilation unit.



A rotating turret is mounted on the body of the APC. It contains a 14.5-mm machinegun and coaxial 7.62-mm machinegun. They can be used to fire on either ground or aerial targets. We will note that the assault party being transported also can fire against ground targets from small arms and automatic weapons.

The power plant used is a high-rpm, 8-cylinder diesel of Czech manufacture designated the Tatra T-928. At 2000 rpm it develops 180 HP and gives a maximum speed on the highway of 95 km/hr. The vehicle crosses water obstacles at a speed of 10 km/hr and is powered by two propellers. The APC has fuel for 650 km travel.

Production of the APCs in the Polish People's Republic was set up at one of the plants. In talking with us, the technical director of this enterprise said that their plant had been given the honorable duty, and they had decided to accomplish it in the best manner possible. The beginning was very difficult. There was a lack of trained and experienced cadres, of production areas, and of the necessary equipment. They overcame the difficulties quite

successfully. Experience gained in manufacture of the APCs is being used to increase the quality of peacetime production.

The plant performs complete assembly of the APC, however many enterprises in Poland and Czechoslovakia take part in manufacturing parts, assemblies, and units. We visited the main shop where a conveyor is installed which carries the welded bodies from the neighboring shop. With the help of a powerful bridge crane they are set on the previously prepared trolley. In specific time intervals the train of trolleys moves along the conveyor, delivering the body to the next station, where a particular unit is installed. Not so much time goes by until a combat vehicle ready for plant testing comes off the conveyor.

The plant's chief design engineer, who familiarized us with the assembly process, noted: "This work gives me complete professional satisfaction. True, I had to change my specialty somewhat, but I did this out of desire, since the problem was interesting and important for increasing the defensive might of the country. Before beginning production of the APCs, we worked a great deal with our Czech colleagues. Then we conducted a number of experiments and test runs of the first models. Now we have every basis to state that the APCs being put out by the plant are fully reliable."

TRAINING COMPLEX

Engr-Capt 1st Rank K. Burgardt, Engr-Capt-Lt V. Kebko

The ties of theoretical disciplines with the practice of shipboard service, with that concrete work which lies ahead of each graduate, comprises a subject of special concern of the professors and instructors of the Leningrad Higher Naval Engineering School. For this purpose, for example, we have worked out and introduced into the training process a special training complex -- a trainer for preparing the electrotechnical gear of BCh [boyevaya chast'; battle station]-5 for combat and for movement.

The trainer includes a group of stations which are directly related to work with the main electrotechnical gear of the warship's BCh-5. All of them are outfitted in the same way as actual shipboard stations (see picture). This is the power engineering and survivability station, where we have the engine telegraph, steering indicator receivers, and generator control panel. The non-battery command switchboard of the STK type and the switchboard of the "Kashtan" type are used as means of communication. Watch and electrotechnical logs are kept up at the command post.

First of the combat stations is the ship's power station. Here there are two MSK type generators (a turbogenerator and a diesel generator), the main distribution frame, and a remote control and supervision panel. There is the possibility of switching the station to the automatic system. The station has a "Kashtan" switchboard and a telephone set. Students working at this station keep generator logs.

The group station of electricians of the ship's emergency party is equipped with electric drives for deck machinery, with instruments for controlling the ship (main and emergency telegraphs), and with signal beacons. Communications with the command post is by voice, via other combat stations.

The steering arrangement with electrical drive and a system of steering indicators is mounted at a separate station. It is connected with the command post by telephone. There also is a post for control of the demagnetization device. It is equipped with prescribed apparatus and simulators. Communications at this station is with the telephone.

Students training at the power engineering and survivability station

All stations can be fed typical malfunctions. The trainer's capabilities are very broad. They are revealed most fully at the examination held at the end of the theoretical course against a background of special ship's preparations for combat and for getting underway.

At such an exercise several tasks are to be resolved. The students become familiar with the organization of normal and special preparations of the BCh-5 electrotechnical gear for combat and for getting underway. They acquire skills in preparing for starting up, switching on and servicing the main electrotechnical means, and they learn to detect and eliminate typical malfunctions, keep up combat and maintenance documents, use the intraship technical means of communication, and master command language. But we feel the most important is that in the process of training and exercising, the students independently make decisions of an organizational and engineer-technical nature characteristic of the work of a ship's officer.

The exercise is in two phases. In the first (preparatory) phase the students familiarize themselves with the typical exercise schedule and study the combat instructions and maintenance instructions. At the same time they learn to use means of communication and develop practical actions for preparing, switching on (starting up), and servicing all technical gear at the combat stations and command post. At this very same time they also master the rules of keeping combat and maintenance documentation, and study the typical malfunctions and methods for detecting and eliminating them.

Before conducting the second (examination) phase, the exercise director places the students at the various stations and instructs them. Then he also

instructs the umpires at each of the stations. This phase begins with the signal "Combat alert. Prepare the ship for combat and for getting underway urgently." The students take their places and act in accordance with instructions and the schedule table.

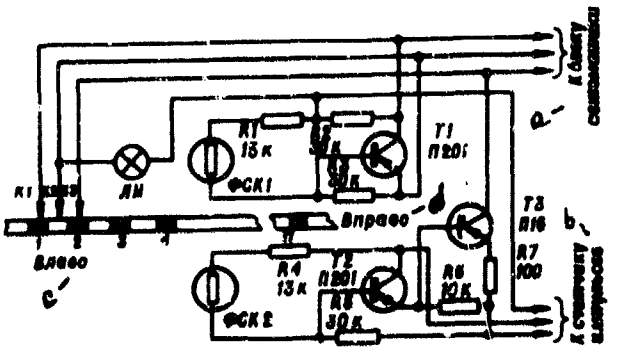
According to the course of actions unfolding, the umpires introduce typical malfunctions and give supplementary situation statements. At the conclusion of readying the ship for combat and for getting underway (after a report from the command post to the exercise director about the readiness of BCh-5), the director listens to the reports of the umpires, holds a critique, and evaluates the actions of each student. The experience of such exercises attests to their high degree of effectiveness.

TAPE RECORDER ACCESSORY

Engr-Maj V. Alekseyev

When using a tape recorder for training purposes there is sometimes need for a remote control of its operation. For this purpose, the Penza Higher Artillery Engineer School developed and introduced an accessory for the "Dnepr-11" and "Dnepr-12" type recorders.

Using the accessory control panel it is possible to remotely switch on or off the tape recorder and wind to the right or left. The accessory circuitry provides for automatic switching of the recorder from a fast wind to play mode on locating the correct segment of recording. There are also provisions for automatic stop at the end of the recording or if the tape breaks.



KEY: a -- to automatic unit; b -- to pulse counter; c -- to the left; d -- to the right.

The accessory circuit consists of a master device, pulse counter, automatic unit, switching device, and control panel. The master device (see sketch) sends signals to the pulse counter on passage of the foil strip stuck to the magnetic tape. The circuit can be made with or without contact.

The main elements of the master device in the first version (with contact) are three special contacts K1, K2, and K3. Two of them are installed on the magnetic tape guide. They are made of insulated copper wire wound on the guide. The third is mounted on the tape recorder pressure lever.

The contactless master device consists of two stages assembled from transistorized dc amplifiers with photoconductors. The amplifier, assembled on one transistor, serves to place the pulse counter in operation. The other amplifier has two transistors, and creates the signals stopping the recorder in case the tape breaks. A KM-3 type light is used for illumination.

The pulse counter serves as the accessory element which determines the desired tape segment. It consists of two triggers with emitter repeaters and relays, a reversible electric motor (type RD-09 with reduction of 1/15.6), a fixed 24-position contactor, and separation diodes.

The switching device switches the keys of the recorder according to a signal coming both from the automatic unit or from the control panel. It consists of three relays (type RKN) and four solenoids. The solenoids, joined into an independent unit, are designed for 127 volts dc. On the lower ends of their rods are rubber tips to soften the blow when the unit is switched on, and on the upper ends are washers to place the contacts in operation. To dampen the self-induced emf type D305 diodes are placed in parallel with the solenoid windings.

The automatic unit switches the recorder from one operating mode to another. It is built on a time relay and an electromagnetic relay of the RKN type.

The control panel allows remote switching of the recorder from one operating mode to another.

"PROTON" SLIDE PROJECTOR

Engr-Lt Col V. Chumarin

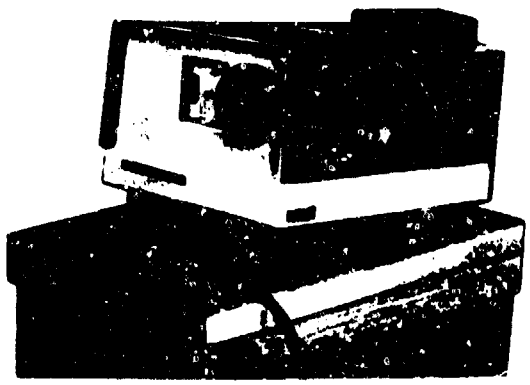


Fig. 1. General view of the "Proton" slide projector

The "Proton" automatic slide projector (Fig. 1), a native product, is designed for projecting black and white and color slides (made on film or glass) onto a screen. It is equipped with devices which permit showing slides singly from a remote control, automatic operation with identical or different time intervals (with a repetition of cycles), and automatic selection of slides.

The projector allows giving a demonstration without darkening the room, which is psychologically very important: the attention of the students is not diffused, the working contact between the instructor and the students is not broken, and the latter can make the necessary notes. Availability of a remote control permits the instructor to independently switch on the instrument at the necessary moments in the lecture from a distance of up to 12-15 meters from any point in the room and show the slides in any sequence regardless of their placement in the cassette.

The projector has the "Triplet" projection lens with a focus of 75 mm and a relative aperture of 1:2.8 (the manufacturing plant can install lenses

with a focus of 100 or 150 mm). Size of the picture depends on the lens used and the distance of the instrument from the screen (see table). However it is 0.44x0.66 with a minimum distance of the lens from the screen, or 1.82x 2.7 meters at the maximum distance.

Distance from lens to screen, in meters	Lens focus, in millimeters
Minimum -- 1.5 Maximum -- 6	75
Minimum -- 2 Maximum -- 8	100
Minimum -- 3 Maximum -- 12	150

The cassette holds 36 slides 50x50 mm in size with a working surface of 23x34 mm. With work from the timer, the demonstration time is from 3 to 40 seconds, and when working according to a given program -- 7, 14, 21, or 28 seconds. The light source is a K-220 v -- 300-2 projection bulb or a K-127 v -- 300-2 bulb, providing a light beam of at least 350 lumens.

The main optical scheme of the instrument is shown in sketch 2.

Fig. 2. Optical diagram of the "Proton" slide projector: 1 -- reflector; 2 -- light source; 3 -- converging lens; 4 -- heat filter; 5 -- slide window; 6 -- objective; 7 -- screen.

It is well if the projector is situated to the instructor's left during the lecture. To his right could be placed an instrument for showing diagrams of the lectures, to be used jointly with the projector. Two movable legs are used to properly place the instrument relative to the screen in height. With their help the angle of inclination of the projector in relation to the screen reaches six degrees. Sharpness of the image being projected is achieved with a special key placed on the remote control unit.

The "Proton" is simple and cheap to produce. Forty to sixty sheets of drawing paper is needed to produce 8-10 diagrams for illustrating lectures, along with 35-40 meters of gauze, liderin [translitcrated from the Russian], paste, and India ink. To make 36 colored slides we need just one reversible color film, chemicals to develop it, and a box to store the slides in. With

an increase in number of slide prints, the expenditures for one print drops 2.5-3 times.

The practice of organizing the training process shows that it is desirable to employ diagrams, drawings, and tables in addition to using film projector, kodoskopy [transliterated from the Russian], slide projectors, epidiascopes, and other technical means to illustrate training and separate parts of a lecture.

WINTER IS NO HINDRANCE

Maj A. Gerasimenko

In order for a mobile dispensing station to operate faultlessly in low temperatures, we usually conduct supplementary work when preparing the equipment for winter operation in addition to those operations prescribed by the appropriate service manuals.

Thus, the engine of the ZIL-157 vehicle is covered with a warming hood and the cooling system is filled with type 60 or 40 low-freezing liquid. The organic preheaters are checked and prepared. Storage batteries are covered with felt, and the cell covers are left open so that during the charging period the gases can freely be given off.

PR-4 nozzles, hose nozzles, plugs, and union nuts are definitely cleaned of lubricant and are either left dry or are lubricated with winter motor oil. Bearings of the 2.5 VS-3a pump are lubricated with grease which has been first heated up and to which has been added 15-20 percent motor oil. In so doing, the lubricant is placed into the bracket through the upper plug hole. The layer must be at least 2 mm thick. The presence of lubricant during operation is checked according to the degree to which the bearings heat up, and before the pump is started it is checked by using a thin copper wire dipstick, placing it into the hole up to the stop.

We should note that we must partially disassemble the mechanical pump once a year on line vehicles and twice a year on training vehicles. In so doing, it is carefully washed and cleaned, then the by-pass valve is adjusted if necessary. If the counterpressure is 3.5 atmospheres, the pump provides 250-300 liters/minute efficiency.

We definitely perform hydraulic tests of the liquid pipelines, clean the internal surface of the tank, and lubricate it with motor oil or cover it with drying oil. The valves are taken apart, cleaned, and lubricated with motor oil. The spare parts kit is replenished.

In preparing special equipment for operation in low temperatures, we inspect it carefully. If possible, the power take-off gear case, mechanical

pump case, and valves are heated with steam or hot water. Open fire must not be used for this purpose, since the iron parts of the pump could burst if locally overheated. If the tank is filled with a solution based on inflammable solvents, a fire could break out.

When the pump is heated through, the oil is poured from it in order to avoid soiling the pipelines for liquid. Then all threaded connections are tightened up and, switching the pump on, we check using the starting handle to see if the shaft turns. This must be done because the working wheel of the pump might freeze tight to the case. If in such a case the pump is switched on from the vehicle's engine, the pump parts will inevitably break or the drive will go out of order, or perhaps even the power take-off gear.

If the pump shaft doesn't turn, then the case is heated again or the cover is removed and ice is removed from the pump cavity. In preparing the pump for operation in this manner, it is started at low rpm smoothly, without jerks.

Inasmuch as rubber hoses lose their elasticity at low temperatures, they should not be bent sharply while working with the pump.

It is categorically forbidden to pump liquid without using a filter, since hard particles (small pebbles, ice, etc.) could get into the mechanical pump, and the rotor blades, which means the drive as well, could go out of order.

From time to time liquid freezes in the pump and the pipelines, and they are then warmed with hot water or steam. But water and steam are not always at hand, especially in the field. Therefore it is recommended that the liquid pipeline parts and the pump be warmed using the vehicle's exhaust. For this purpose, to the end of the vehicle's muffler exhaust pipe we weld a ring using gas welding, and at a distance of 150-200 mm from the end of the pipe we put a gas sampler /gazootbornik/. We place a valve plug, which is in the DK-4 set, on the welded ring. To the gas sampler we attach a rubber-metal sleeve with an adapter which can be attached to the one-inch pipe connection of the discharge pipe of the mobile station. Using such a simple device we can warm the liquid pipeline parts from the outside and from the inside, and can also blow out the hoses and sleeves.

At the end of work the liquid is immediately drained from the tank and mechanical pump. Here we must remember that it is not sufficient to unscrew the drain plug of the pump to the level of the radial apertures, it must be unscrewed completely. We must also remember that the small radial apertures of the drain plug of the pump can be easily soiled and clogged with an icy plug. Therefore, in draining water from the pump, we must rotate its shaft. This ensures complete drainage.

Hoses can be blown out either with exhaust gases or with air from the vehicle's brake system. In the latter instance it is enough to unscrew the top of the air selection cock on the vehicle and in its place screw on the adapter from the ARS-12U set. A sleeve 6 meters long with a diameter of 25 mm is attached to the adapter with one end, and the other end goes to the distributing collector. The hoses are blown out by opening the air cock.

The nozzles with brushes, after being removed from the hoses, are hung on the bottom edge of a box with stopcocks down. The stopcocks are opened so that the remains of fluid can drain from the channel. After this the hoses and sleeves are carefully dried and stowed, with the threads lubricated with motor oil. Two liters of used motor oil is poured into the pump to guard its parts against corrosion. In addition, if some fluid still remains in the pump, the oil will not allow a solid mass of ice to form. It is well to treat the ARS-12U tank with low-freezing solutions containing organic solvents and ammonia water. However it is well to remember that at temperatures below 15 degrees Centigrade the so-called "setting" could take place at the moment the DTS GK suspension is prepared if it contains more than eight percent active chlorine. This will become a dense, hard sediment which is difficult to remove. To avoid this, at low temperatures 0.2 kg of sodium hexametaphosphate is added, in addition to water-soluble glass, to each 1000 liters of water.

In the process of operating and servicing the vehicular dispensing station we must observe safety rules. In preparing decontaminating or insecticide solutions and suspensions, and when pulverizing substances of an alkaline nature, it is obligatory to don protective gear. When filling the tank we must open the plug of the indicator rod pipe and the hatch of the tank. If the vehicle is used to transport flammable substances or to work with solutions which are apt to catch fire, it is necessary to place antiblast nets in the tank neck. Of course, in the process of servicing the dispensing station we must use only tools and hoisting mechanisms which are in working order.

Thus the timely and qualitative performance of all measures as set forth here is a guarantee of faultless operation of the ARS-12U in low temperatures.

MAINTAINING COMBAT TRAINING VEHICLES

Engr-Maj Ye. Portnovich

The specific nature of our conditions -- hot climate and great dustiness -- demands particularly thorough supervision over the condition of all systems and assemblies of tanks and other combat equipment. We strictly schedule times for routine maintenance to ensure the constant readiness of our inventory of combat training vehicles. For prophylactic work we make use of any breaks in operation. We additionally service the vehicles even when 150-200 km remain until the next numbered TO [tekhnicheskoye obsluzhivaniye; technical maintenance]. As a rule, vehicles are also serviced when eliminating any kind of disorder discovered on the range or tank driving course. As we have seen this permits timely discovery of minor malfunctions which later would require more serious work, and it also makes it possible to keep the adjustable connections within necessary limits. There is a saving on fuel and lubricants, and we succeed in considerably extending the vehicles' service time between repairs.

In preparing tanks for the spring-summer or fall-winter operating period, we carefully wash deposits from the cooling system with boiling water containing a three-ingredient additive. For this purpose we prepare the water in a fixed water-and-oil heater, and the solution in a special container. We not only use this to wash with, but to fill up the cooling system for operation during the entire summer period. As the solution is used up in the container, we constantly add to it and keep a necessary reserve.

The manual on equipment and operation of the medium tank states that the steam-air valves are checked during TO No 2. Experience has shown that under our conditions it is well to perform this operation more often. In our motor pool is a permanent station which checks valves, and not only the condition of the valves, but of other parts of the cooling system. Malfunctions discovered are immediately corrected. Information on the condition of the steam-air valves on the vehicles, and on what adjustments have been made, are kept in a special log. From such entries it is easy to establish whether the valves on any combat training vehicle are in order or not. We are convinced that the presence of such a station considerably saves on crew time in servicing tanks.

We know that the life of an engine is increased if clean oil without mechanical impurities is kept constantly in the oil system during operation. It must be changed more often than usual under conditions of increased dust, which naturally increases the cost of operating the equipment. We have begun separating the oil. For this we have a special station at which there is an NSM-2 oil-cleaning unit. Now the mechanic-driver only has to put the vehicle on the rack and the oil is completely cleaned in 10-15 minutes without draining it.

We also service a number of other assemblies and units on combat training vehicles ahead of schedule. Thus, the starter bearings on vehicles where they are the main means for starting are serviced during TO No 1 (the manual prescribes this operation during TO No 2). The US lubricant in road wheel bearings and in rocking shaft sleeves is changed not during TO No 1 or 2, but considerably more often.

To perform the necessary work we have set up a special station for two vehicles (combining it with the oil separation station). Here we have installed a rack, near which are boxes containing hoses with adapters. The hoses are connected with lines delivering lubricant from the AZ-1E filling units fixed in a nearby building. On the open box lids, which form a working area, the mechanic-driver places his wrenches and tank lids, and the armored cowls of the driving and road wheels.

The air-cleaner cassettes are washed every 150-200 km, i.e., after each trip.

This work is performed on a production line equipped with a special rack for washing the cassettes, a compressed air line bringing air from a compressor, and boxes with an electric oil heater (up to 80-95 degrees Centigrade). Here too is a shelf rack with an oil-collector on which the cassettes are placed at an angle of 45 degrees to remove excess oil.

Innovators' efforts went into producing the cassette washing stand. It is a 300 liter vat above which is a basket which turns 360 degrees. Three cassettes can be placed in a row. The basket is driven by a mechanical crank. Above the cassette basket is a line with nozzle openings, connected by a hose with a rotary fuel pump. Fuel is sent to the pump through an intake hose connecting the pump with the stand vat. The pump and electric motor are mounted on a bracket welded to the vat. The stand permits washing a set of cassettes in 3-5 minutes.

For servicing the vehicles after returning to the motor pool we have set up an air-cleaning station to get rid of dust. Twenty vehicles can be handled at once. Compressed air is delivered from fixed compressors. In dry weather, after cleaning with compressed air, the vehicles can bypass the washing point and go to the refueling point, which can handle ten vehicles. The washing point has the same capacity. At the daily service point there are sets of tools and lifters for the mechanic-drivers, and specialized stations as well.

OPERATING FEATURES OF MOBILE TRANSFORMER SUBSTATIONS

Engr-Lt Col M. Val'dman

The operation of mobile transformer substations (PTP) has a number of features, knowledge of which helps keep up their absolute reliability and constant readiness for operation.

Substation transformers are equipped with devices for regulating voltages at their output within limits of ±5 percent from nominal. Regulation takes place by a change in the transformation ratio with the help of additional taps off the windings. For example, the two-winding transformer of the 2rd unit of the PTP-180 has additional taps on the high voltage winding, and the three-winding transformer of the 1st unit has them on windings of the highest and medium voltages.

If the voltage at the transformer output is higher than nominal (+5 percent), then to reduce it the number of loops of the primary winding must be increased. If it is lower (-5 percent), then the number of loops must be decreased.

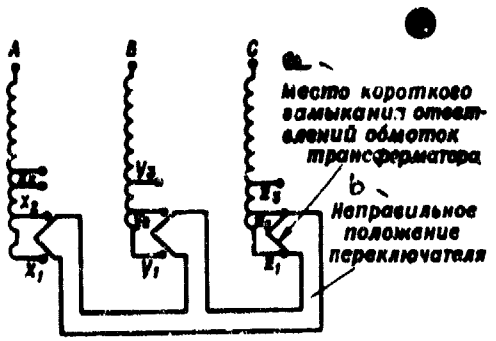


Fig. 1. Diagram of transformer winding tap switch
KEY: a -- transformer winding taps are shorted here;
b -- improper position of the switch.

Switching from one tap to another is accomplished by a special switch (Fig. 1), the lever of which is brought out of the top of the transformer. The switch consists of special contact rods (according to the number of taps) and contact rings. Position I serves to reduce the voltage (if the circuit voltage is higher than nominal by +5 percent), and position III increases it (if the circuit voltage is below nominal by -5 percent). For normal transformer operation it is necessary to ensure reliable contact when moving from one degree of voltage to another. For this purpose the switch lever must definitely be moved to the detent point. In practice, however, it is not always placed in this position (Fig. 2). The latter could lead to a short circuit, and thus to a malfunction of the transformer.

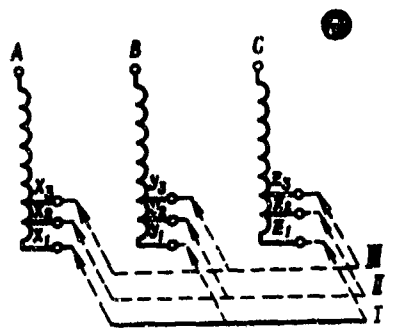


Fig. 2. Diagram of improper switch positioning.

Contact reliability when moving from one level to another is checked with the AVO-5M. If the switch is correctly placed, the resistance between any phases must be minimal.

During substation operation we must also keep an eye on the KTV-35 ac contactor. Its tractive force changes from 0 to a maximum value with a frequency double that of the supply current. When the tractive force passes the zero value the forces of resistance could draw away the low-inertia armature, set it to vibrating, and even to sparking of contacts. To eliminate this phenomenon the tractive force is created with two sinusoidal fluxes with somewhat different phases so that the total tractive force does not reach zero values. A shorted copper loop on the core serves as the second coil. We must ensure that it always is firmly seated and does not shift. If it does shift, increased vibration arises and the loop goes out of order. Increase of the air gap between the moving and fixed part of the core due to misalignment, loose fit, or soiling leads to an increase in the resistance of the magnetic circuit, a decrease in the inductive resistance, and an increase in current in the winding. The latter causes overheating of the contactor and its malfunctioning. Increased vibration and noise are characteristic signs of this malfunction. To eliminate it we must perform a careful alignment of the moving and fixed parts during scheduled maintenance.

Mechanical blocking of the moving part after switching on and automatic switching out of the coil with the help of an end switch considerably increase the life of the contactor.

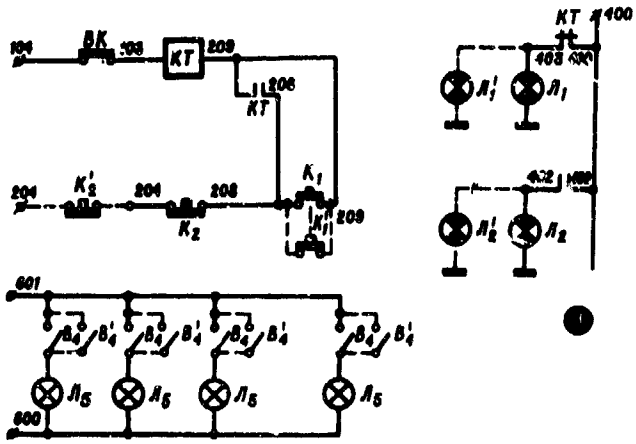


Fig. 3. Diagram of PTP-180 remote control panel. Dotted line shows the changes made in the basic diagram.

To improve the working conditions of the personnel and increase maintenance safety, we have developed a remote control panel for the substation (Fig. 3), mounted in the distribution cabin. From here it is possible to control the switching on and off of the substation, and also to regulate voltage using a bank of lamps.

Electrical energy goes from the substations to consumers over flexible cab-tire cables with rubber insulation and a rubber protective casing. Their operation also has a number of features. The most frequent cause for the cable to malfunction is a reduction in insulation resistance. This usually takes place as a result of the destructive effect on rubber of oxygen in the air, of light, and ozone. The latter is particularly dangerous, since it destroys the double bonds of molecules on the rubber's surface. If it is not stretched and does not have internal stresses, then a breakup of molecules on the surface does not cause a destruction of the entire mass. But in stretched rubber which is under the influence of ozone, small cracks form which give access to the inner layers. The process of molecular destruction also continues there. There begins a progressive destruction of the rubber throughout its thickness. It is sufficient to have 0.0001 percent ozone in the air for the first cracks to form in stretched rubber in just an hour's time.

To reduce the effects of ozone we must reduce the internal stresses in any way possible. Therefore a bend in the cable must be accomplished with the largest possible radius (at least 10-12 outer diameters of the cable). To remove stresses in cable lay-up, the excess cable must be wound

in the form of a figure-eight. It is categorically forbidden to loop the cable, as this leads to formation of "curls" or damage of insulation.

A second and most important reason for cable damage is the ability of rubber to absorb moisture, which leads to an increase of dielectric losses and dielectric penetrability of the insulation. If the insulating rubber is in the water for 30 days its electric strength decreases by 40-60 percent.

In winter the particles of moisture increase in volume when they freeze and as a result there arise additional internal stresses, which to an even greater degree reduce the stability of rubber toward the influence of ozone.

Leakage current through the moist segments could cause a thermal rupture of the insulation with a voltage considerably less than normal. Therefore the cable must be laid in trenches on special supports and protected against the effects of direct solar rays and precipitation.

COUPLING RADIO AND RADIO-RELAY SETS

Lt Col O. Mikhaylovskiy

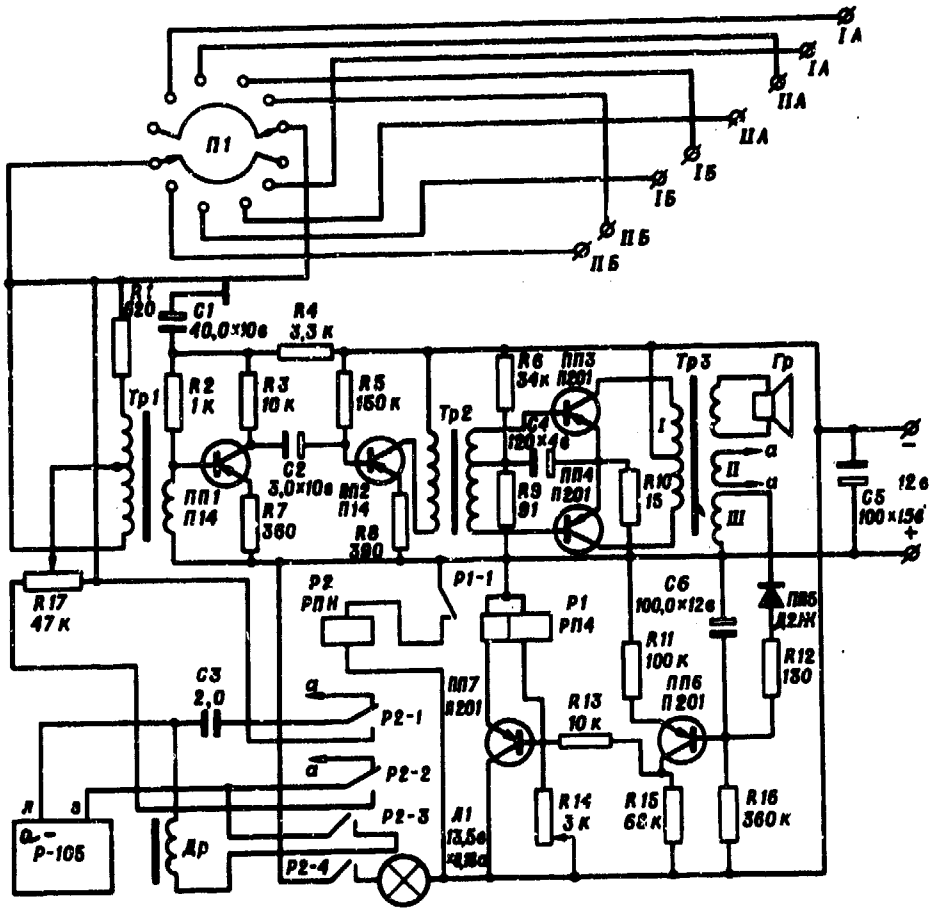
Communications podrazdeleniye which go out for a field exercise often have need to operate radio-relay stations coupled with VHF sets. However, the radio-relay and VHF radios lack adapters which make automatic coupling possible. Manual switching of VHF sets, even if the radiotelephone operators and radio-relay technicians are highly trained, does not ensure timely switch from receive to transmit.

To simplify the operation in this mode we have created and adopted a device which automatically switches VHF radios from receive to transmit and back in the process of carrying on an exchange over a coupled radio channel. Thanks to this we ensure a high quality of speech transmission, and the radiotelephone operators (or radio-relay technicians) are freed from the need to relay the transmission.

The device (see sketch) includes a hybrid set, low frequency amplifier, dc amplifier, and electronic relay. A conversation received over one of the radio-relay channels goes through switch P1 to the input of the hybrid set, which makes the transition from the two-wire line of the radio-relay station to the four-wire (separates the receive from the transmit channel). Switch P1 hooks in to the input of the device any of the four telephone channels of both half-sets of the radio-relay station.

The hybrid set is an electrical bridge, two arms of which are formed by transformer Tr1, and the other two are formed by resistor R1 and the radio-relay telephone channel. A balanced bridge is employed in the circuit. The signals from one of its diagonals do not enter another, i.e., speech received by the VHF set and sent to the hybrid set passes only into the radio-relay communications channel and does not pass along the device's channel.

However, signals coming from the radio-relay channel go only through the device, and do not reach the VHF set. The hybrid set employed in this circuit weakens the audio frequency oscillations sent from the VHF set by approximately a hundredfold. This practically fully precludes interference from the radio channel and false operation of the device's electronic relay.



Basic electrical circuit of a device for coupling radio and radio-relay sets. KEY: а -- R-105

After passing the hybrid set, signals from the radio-relay channel go to the input of the audio frequency amplifier. Its two first stages are P14 crystal triodes (PP1 and PP2) in the circuit with grounded emitter, and the output stage is two P201 triodes (PP3-PP4) in the circuit with the common emitter. Resistors R7, R8, and R10 and capacitor C4 serve to stabilize the working points of the crystal triodes. With an input signal level of 200 millivolts, the amplifier provides a voltage of 2 volts (at winding II) and 12 volts (at winding III) at the transformer Tr3 output. This audio voltage from winding II goes to contacts of relay R2 and then to the VHF set. From winding III signals go to the input of detector PP5, are rectified, and are sent to the dc amplifier in the form of constant voltage.

The constant voltage, directly proportional to the level of loudness of the speech, builds up on condenser C6, is amplified by the dc amplifier (on triode PP6), and on reaching the optimal level opens triode PP7 of the

electronic relay. As a result electromechanical relay R1 (RP-4) operates. It switches on the ten-contact control relay R2, which provides switching of the speech circuits. The electronic relay has a time delay up to five seconds, which is necessary to keep the radio set in the "Transmit" mode during pauses in the conversation.

Thus, signals coming from a radio-relay channel and passing through the device, automatically switch the VHF radio set to transmit and are relayed further over the radio communications channel to the subscriber. During pauses in the conversation which do not exceed five seconds the device continues to provide a relay toward the radio channel. After the conversation on the radio-relay channel ceases and after five seconds have passed, the electronic relay switches relays R1 and R2 into the initial position. The radio set returns to the receive mode, and signals from the radio set enter the radio-relay channel of communications (through the potentiometer of the hybrid set R17), causing indicator light L1 to glow.

The device provides for supervision of the conversations during relay by listening with the aid of an electrodynamic loudspeaker hooked to the output of the low frequency amplifier.

SURVIVABILITY OF A SHIP UNDER REPAIR

Engr-Capt 1st Rank I. Korotkin

Repair and drydocking represent a special period in the operation of a warship when part of its technical gear -- mechanisms, systems, and assemblies -- is temporarily out of action. This condition demands that personnel treble their vigilance. The main task of each crew member of a ship under repair is to ensure that throughout this entire period, no matter how long it is, all safety requirements are observed and all steps taken to ensure the survivability of the ship and the total preclusion of emergency situations.

Let us examine certain features of ensuring survivability of a ship under routine and medium repair.

Before beginning work on the ship the munitions are unloaded without fail, and fuel and lubricants are removed. If welding and other work involving open flame is planned, fuel and oil tanks are carefully cleaned and steamed out, otherwise fires might break out.

By the beginning of the factory repair, the crew has thoroughly checked and if necessary replenished the set of emergency rescue and firefighting gear and has put it in readiness for immediate use.

The plant on its part also prepares means to fight for survivability. It provides the ship with electrical power not only for illumination and for performing repair work, but also for operating pumping and firefighting systems and other means of fighting for survivability. In the plant area set aside for berthing all safety measures must be observed and portable firefighting gear must be placed there.

A joint plan for fighting for a ship's survivability is usually worked out for more precise delimitation of functions and for increased responsibility before beginning of repairs. Here there are provisions for use not only of ship's personnel and equipment, but also those of the plant. Inasmuch as the ship's command has responsibility for survivability during repair, the crew has the duty of continually observing all plant work which could directly or

indirectly affect the ship's survivability -- whether it be overhaul of mechanisms and systems, repair of electrical equipment, or replacement of hull cover sheets.

It is very important that the plant specialists and the ship's command set up business contacts and arrange for mutual information and agreements on upcoming work and measures to ensure their safety. Both the ship's crew and plant workers must have good knowledge of plant and ship procedures and hold to them rigidly. Particular attention must be directed toward how all workers follow the ship's rules and observe measures of caution and safety. They must be informed that the ship's commander has the right and is obligated to halt any work on the ship if demands of survivability and safety rules are violated.

Just how is unsinkability of a ship ensured during repair work?

During this important period work procedures are followed which ensure that during repair the tightness of structures which contribute to a ship's unsinkability are preserved to the greatest possible degree. This includes not only bulkheads and decks, but watertight hatches, doors, and vents.

All apertures which are formed in the watertight hull of a subsurface or surface ship as a result of disassembly work are immediately stopped with plugs or other devices which restore the watertightness of structures at places of disassembly. This situation extends fully to hull sheets removed for onloading of equipment. Watertightness is also attempted when leading power cables and air hoses from shore to ship. If power cables and hoses are extended through hatches and other apertures of a watertight ship, we must allow for the possibility of quickly removing them and battening the hatches in case of urgent need.

The watertight hull, its coverings, and gear for fighting water and fires are repaired under a special schedule which provides for a certain sequence of work and its fulfillment in the shortest possible time. The schedule must observe the principle of sequence of repair of important watertight covers. On submarines, for example, this relates primarily to the covers of access, torpedo-loading, and other hatches and to doors of the watertight bulkheads. Work involving a violation of tightness of watertight structures, assemblies, and systems is usually performed within the bounds of one autonomous compartment.

An object of particular concern for engineer-mechanics during repair work is supervision over the weight load of the ship. A change in this often lowers its stability. In order to constantly know the state of stability, it is necessary to organize on the ship a special accounting for movement of loads and the presence of free liquid surfaces. Account must be taken also of all cases where the watertightness is violated during repair.

Danger of outbreak of fire during repairs rises substantially if work involving open flame is not well enough organized. Such work must in

no case be allowed in areas of the ship subject to fires if fuel and oil tanks have not been cleaned ahead of time and if working areas have not been protected against fire. In accordance with the Ship's Regulations, supervision must be set up over the welding and other work involving open flame, and also over the repair of electrical equipment.

We must rigidly supervise electrotechnical work and see that it is performed in accordance with established norms ensuring safety of the ship and its personnel. Improper performance of such work is one of the main sources of the outbreak of fires on a ship.

It is fully understandable that for the entire period of repair we must provide for such efficiency of the pumping and other gear (fixed or portable) which will ensure effective enough battle against fires and water.

Any emergency involving external water coming on board or the outbreak of fire must be quickly resolved using the ship's and so-called "off-ship" personnel and equipment. Therefore, for practicing coordination of the crew of a ship under repair with personnel of off-ship chast' and organizations, it is well to periodically conduct joint practices and exercises, during which we definitely check the operation of technical means of fighting for survivability.

In contrast to current and medium repairs, drydock repairs have their peculiarities, caused by the unique stages of drydocking a ship. There are four such stages. In the first stage the ship is readied for drydocking, in the second it is placed in the dock and set on it, in the third work is performed in the dock, and in the fourth the dock is filled with water and the ship removed. In all stages there must be complete provision for survivability and safety of the ship so as to preclude emergencies and accidents involving personnel.

When preparing for drydocking (stage I), the ship's heel and trim must be brought to a minimum and must not exceed allowable values. If this is not the case, the seating on the way and cages /kletki/ will be uneven, which might lead to a disruption of the ship's local rigidity. In a floating dock the trim and heel of the ship are dangerous for the entire "dock-ship" system.

To ensure fire safety, steam boilers are put out of operation, all unnecessary and inflammable objects are removed from the ship, its firefighting condition is carefully checked, and above all the resistance of insulation of the ship's circuits and electrical mechanisms is supervised. This must be no lower than operating norms. Before a submarine is placed in the dock the storage battery is charged without fail and the high pressure air reserve is replenished.

Before placing the ship in the dock (stage II), all side apertures are battened and particularly thorough observation is set up over the watertight areas near which the cages and way are placed. When the ship is in the dock we check its seating on the keel blocks to prevent dents in the hull. In winter it is recommended that all main lines be blown out to prevent their freezing.

In the drydock process (stage III), the crew must continuously observe the watertightness of the hull and the condition not only of means of fighting for unsinkability of the ship, but of the dock itself and its flood gate (in a dry dock). In case water gets into the dock by accident, personnel must immediately take steps to make the ship's hull watertight. In addition, the crew aids in eliminating the emergency in the dock.

At the end of all work and before filling the dock with water, the men check all watertight areas, tie down shifting loads, check the condition of the ship's weight load and the stowage and fastening of solid ballast, and ready means of fighting for survivability for operation.

When the dock is being filled with water and the ship removed (stage IV), the crew keeps an attentive eye on the trim and heel, and also on the seal of the watertight hull.

Precise organization of work, attentiveness, foresight, and once again foresight -- this is what is required of a ship's crew while the ship is undergoing repair.

INCENDIARY BULLET

Unattributed

In 1855 a Russian officer named Polyanskiy for the first time in Russia proposed a bullet with incendiary effects. It had a cylindrical shape, and within it was an incendiary substance igniting on being fired and burning for 10-15 seconds.

Firing tests to a range of 200 and 800 paces showed a satisfactory incendiary effect of the bullet and a good accuracy.

HOW TO WRITE A REPORT

Engr-Capt 1st Rank V. Smirnov

The time is approaching for drawing up annual reports on results of inventive and innovative work. What should we give attention to in writing them? -- this is the question of Maj A. Limbaytis and Capt V. Davydovskiy.

Deputy chief of the inventions section of the USSR Ministry of Defense, Engr-Capt 1st Rank V. Smirnov, answers this question.

The report on results of inventive and innovative work in the chast' and on the ship is drawn up by the chairman and secretary of the inventions commission according to the format prescribed by the time-sheet of state statistical and bookkeepings records, effective 1 January 1967, and is signed by the chast' commander and head of the financial agency. It is submitted directly to the Chief before 10 January. If the chast' is financed by another chief, a copy of the report is sent to him as well.

The report consists of two parts: numerical indicators (Form 4 NTspets) and explanatory notes. In addition, scientific-research, design-planning organizations, and higher military educational institutions submit information on formulation of claims for inventions according to the format prescribed by the above time-sheet.

What peculiarities must be considered in filling out the report form and making the explanatory entries?

In some reports the column "Number of proposals for which certificates have been issued" reflects the number of certificate blanks issued. It must not be forgotten that many proposals are developed by groups of authors, each of which receives a certificate.

We must check to see that in section II of the report ("Movement of proposals") the sum of digits given in columns 4, 7, 8, 9, 10, and also 1 and 2, equals the figure shown in column 3, and the sum of digits in 5 and 6 equals the figure shown in column 4. If there are any discrepancies in these columns, the reason must be given in the explanatory notes.

In filling out section III, we must remember that savings from the adoption of inventions and innovative proposals are shown only in the actual amount, and not an arbitrary or tentative one. Such savings are usually provided by the adoption of suggestions in enterprises or organizations using cost-accounting. The effect in the technical, combat, training, or other areas from the adoption of proposals in chast' should be shown in the explanatory notes.

We must be especially attentive in compiling the explanations. The first section should contain a detailed account of the measures taken to develop inventive and innovative work, concrete examples of the influence of technical creativity on raising the quality of combat readiness and combat training of chast', and a revelation of the essence and effectiveness of the most valuable proposals. It is necessary to dwell on the proposals borrowed from technical information pamphlets and collections, and stress the effect obtained from their adoption.

The explanatory notes reflect both the successes as well as the shortcomings which hinder further development of inventive and innovative work, and review the possibilities for eliminating such shortcomings. In particular, it is important not only to correctly and fully indicate the course of realization of proposals, but to analyze the reasons for delay in their review and adoption.

We must dwell on the section of explanatory notes which shows the financial support of inventive and innovative work. If, for example, funds were spent on organizational activities, there must be an explanation as to how much was spent and for what specific purposes. Cost-accounting enterprises must definitely indicate the sum of transfers to the All-Union Society of Inventors and Innovators (it must comprise 0.3 percent of the sum of savings realized as a result of adoption of proposals). In this same section we review the questions of the correctness and timeliness of payment of rewards to authors of adopted inventions and innovative proposals, as well as the fullness of use of sums allocated for these purposes.

It is not a difficult job to write a report and explanatory notes in complete accordance with demands of the time-sheet and with methodological instructions of the Inventions Section of the USSR Ministry of Defense on the organization and conduct of inventive and innovative work in the Soviet Army and Navy. Complete and timely reports which contain a thorough analysis, illuminate foremost experience, detail the characteristics of valuable proposals, and show the role of technical creativity and give advice and suggestions on improving the organization of inventive and innovative work, have a substantial influence on its further development in the Army and Navy.

ACTIVENESS GROWS

Engr-Lt Col A. Burdenko, Lt Col Tech Serv A. Kiselev

Inventors and innovators of the Red-Banner Kiev Military District, at their last conference, summed up work done in the Lenin Jubilee Year and during preparations for the 24th CPSU Congress and discussed the course of fulfillment of socialist pledges made by them in the first year of the new five-year plan.

The Deputy Commander of the district, Lt Gen Tank Trps V. Gorban', spoke at the conference, noting that the steady growth in number of proposals submitted and adopted characterized the high creative activeness of district troops. Attention is also drawn to the fact that in just the first training period of the current year the number of claims for inventions was 70 percent of the number submitted for all of 1970 and was almost equal to the number submitted in 1969.

As we know, success does not come of itself. It is a result of constant concern on the part of commanders and Party and Komsomol organizations toward development of technical imagination, coordinated work of inventions commissions, and the conduct of many mass-organizational and propaganda activities. In particular, a stimulus for further development of technical creativity was the jubilee month of collection and realization of innovative proposals conducted in district troop units in 1970. It was an effective means for mobilizing the creative efforts of innovators to perform the tasks before chast', military schools, and repair enterprises.

Military repairmen took an active part in the competition to adopt the most rational equipment for work areas, as announced in Tekhnika i vooruzheniye No 11 for 1970, and already much useful work has been done. By the opening day of the conference 60-70 percent of work areas in repair chast' and enterprises were outfitted in accordance with the demands of scientific organization of labor.

The district is widely adopting the most valuable new developments. This is facilitated by centralized manufacture of new items. For example,

this is how we manufactured sets for troop firing range sector control panels with means of reverse information, and an apparatus for receiving warning signals.

The speaker told in detail about the work of the foremost creative collectives. For example, the chast' where the inventions commission is headed by Officer N. Pomazov won the rotating prize for best status of innovative work for the seventh year. Here favorable conditions have been set up for the work of innovators, and special rooms or corners have been outfitted. Visual agitation has been well organized. Commanders, political workers, and inventions commission members regularly give lectures and talks for the personnel on achievements of native science and technology, and of the importance of technical creativity. The course of fulfillment of socialist pledges on innovation is summed up quarterly and discussed at expanded sessions of inventions commissions.

In the aviation chast' where the inventions commission secretary is Maj Tech Serv A. Kabanov 82 proposals have been adopted in eight months of 1971. Not only engineer-technical personnel, but flight personnel as well, take active part in rationalizing work. The creative labor of chast' personnel has produced, as an example, a test area /gazovochnaya ploshchadka/ with a control-checking station for testing the power plant and main systems of the aircraft and engine. Instrument control laboratories have been outfitted in all services.

The inventive and innovative work in district military schools has been widespread. For example, in the winter training period alone the Voroshilovgrad Higher Military Air School for Navigators imeni Donbass Proletariat received 257 propcsals, of which 238 were adopted to date. The First Khar'kov Red-Banner Military Air-Technical School, with the active participation of innovators, outfitted 19 new laboratories and 15 model demonstration work areas, and created 11 trainers, 64 laboratory units, and other technical training means.

At the repair enterprise where the inventions commission chairman is Engr-Maj G. Polikarpov, the adoption of certain innovative proposals facilitated an increase in labor productivity by more than 3 percent. Tens of thousands of rubles were saved in a year.

The speaker dwelled also on shortcomings in work with innovators. Not everywhere, for example, has the exchange of valuable proposals been set up in the proper manner, and innovators invent what has already been invented. For example, in one chast' the innovators were asked to develop means for mechanizing loading of military goods on vehicles, while this had already been created in another chast'. In places topical plans are not drawn up sufficiently well, the proposed inventions do not always appear, material and, more important, moral stimuli, are not used to the fullest extent.

In conclusion, Lt Gen Tank Trps V. Gorban' set concrete tasks for the innovators of all military specialties, directing particular attention to urging that the creative thinking of soldiers work especially intensively

during field exercises. In the field equipment is operated under conditions near to those of combat. In this situation proposals should arise, adoption of which will facilitate an improvement in conditions of working with weaponry.

The conference announced the Ukases of the Presidium of the USSR Supreme Soviet on awarding to a number of officers the honorary title of honored inventor and honored innovator of the Republic and the order of the district commander-in-chief on rewarding the best innovators and organizers of inventive work. The high titles were given to Engr-Lt Cols V. Volkov, Ye. Lebedev, D. Turskiy, and T. Ivanisov.

Conference participants examined a display of technical creativity, which showed around a thousand exhibits. A majority of them convince one of the fact that the creative thinking of district innovators is concentrated on resolving the tasks of prime importance set by the 24th CPSU Congress: to make more rational use of labor resources and to lower the labor expenditures by reducing manual and hard physical labor.

At the exhibit, rationalizers of Red-Barner Kiev Military District showed effective means to mechanize transport, loading-unloading, and warehouse work in motorized rifle, tank, missile, artillery, and engineer chast'. All of them not only ease labor, but facilitate an increase in combat readiness and a reduction in time of preparation of equipment for combat use.

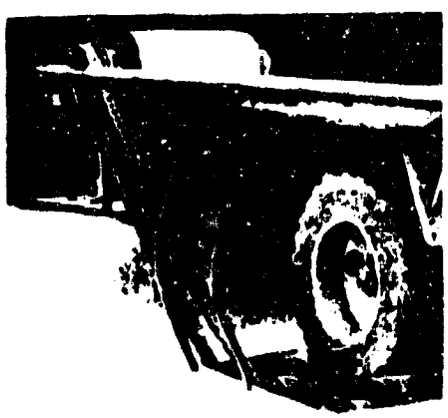


Fig. 1. Belt transporter before beginning of loading.

For example, at the suggestion of Lt Col V. Filimonov, one of the chast' developed a belt transporter (Fig. 1) for loading boxes of weapons and ammunition from the storehouse. The transporter is set in motion by the engine power from the vehicle being loaded. It is a unit which consists of a frame, a four-section roller conveyor, a drive drum, 20 carrying and 8 supporting rollers, tightening mechanism, two rails, mining transporter belts, link chain, and two drums set in a pit. They transmit the turning moment from the right wheel of the vehicle to the transporter.

The transporter was made from materials at hand with local labor. Its effectiveness is rather high: four men can load a vehicle in 4-5 minutes with heavy cargo items.

Of no less value is a means of mechanizing loading work proposed by Engr-Maj B. Chernyakov and Sr Lts A. Bulakh and V. Novitskiy. It includes five wheeled tracks along which loaded trolleys pass. Height of the tracks from the floor of the loading ramp corresponds to the height of a vehicle loading platform, and the loaded trolley rolls into the vehicle body without great effort. Electromechanical traction is delivered from the warehouse to the loading sites for the trolley with the aid of an electrical motor, reducer, and blocks. In case there is no electrical power, this operation can be performed using the vehicle's engine through a system of pulleys. Adoption of above device permits reducing time of loading armored cargo by almost eightfold, and reduces in approximately the same amount the number of personnel needed for this work. The front of work has also expanded. Now nine vehicles can be loaded simultaneously instead of only two.

Lt Col Ye. Chukhno, Capt M. Beloshkurskiy, and Capt M. Stupak developed an interesting set of equipment for mechanizing the loading and unloading of engineer cargo. It consists of a container, platform, 2-ton electric hoist, mechanical roller conveyor, and boom with winch and tourniquet for loading containers. Use of this set has permitted increasing labor productivity in loading-unloading work by threefold and reducing fourfold the number of people needed. Means of mechanization created by Engr-Lt Col P. Leshchinskiy make it possible to more rationally make use of warehouse space and reduce the time for loading chemical defense goods by approximately tenfold.

Repairmen presented at the exhibit convenient specialized work areas and outfitting created in the course of the competition announced in the November 1970 issue of this journal. The electrical repairman's work area adopted in the repair and restoration battalion at the suggestion of Lt V. Blintsov is equipped with a support on which is placed the aggregate under repair, a panel with sockets for 220 and 24 volts, and a desk cabinet in which spare parts are stored. On the rack there is a place for an instrument to check armatures, and there is a detachable support. The bench contains four sectioned tool boxes and a niche for control-measurement instruments. The bench is covered with yellow and light gray plastic, and the instrument rests are made of plexiglas.

Engr-Maj V. Galich and Soviet Army employees Olwynik and V. Nechayev, who are innovative signal men, proposed a radio technician's bench (Fig. 2). It is equipped with shelves for measurement apparatus and with a power panel with voltage regulator.

In the district repair shop, Capt S. Tsigankov, Jr Sgt N. Mushitskiy, and Pvt A. Chumakov created a specialized work area for an electrician for repairing target equipment. It is convenient for working and easy to make. Labor productivity increases by 25-30 percent at such a work area.

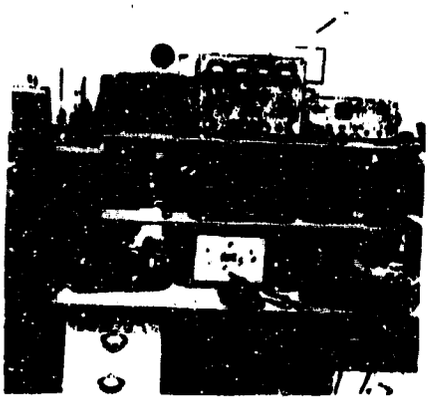


Fig. 2. Radio technician's bench.

One of the elements of a cell room work area is original in manufacture. This is a stand for semiautomatic pouring of electrolyte into storage batteries (Fig. 3), suggested by Lt Col P. Abakumov. It consists of a reservoir holding 1500 liters of electrolyte, a polyethylene 100-liter reservoir with a distributing head, plexiglas plates with pipe connections, a 1.5 liter control jar of plexiglas, a frame with table for delivery and placement of batteries and for supporting the distributing plate, a control panel containing a relay switch, level light, and control toggle switches, a rotating table, and a delivery and removing roller conveyor. Time for pouring electrolyte is cut fivefold with the adoption of such a stand.

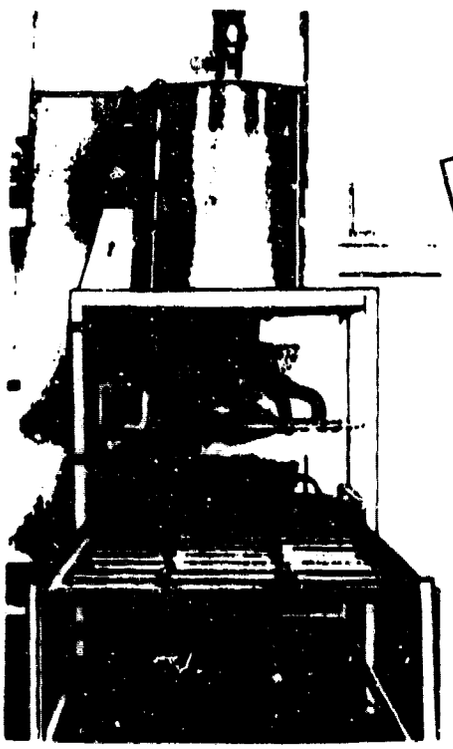


Fig. 3. Stand for semiautomatic pouring of electrolyte into storage batteries

The exhibit showed many technical innovations directed toward the improvement of technology of repair, of methods of operating technology and weaponry, and toward acceleration and increase in quality of scheduled maintenance.

Among many other devices, the aviators submitted a device which can be used to quickly remove the compressor rotor blades, and a device which makes it convenient to straighten pipes with varying forms of warp, and in so doing to maintain their size and shape. The first device is a withdrawal tool with movable holder, which is shifted by means of a variable lever arm. The second replaces the complex hydraulic units. Their authors are Engr-Col A. Lysenko and Engr-Capt E. Isayev. Engr-Maj A. Sokha took part in developing the second device.

Engr-Lt Col V. Batal'yants and Capt Tech Serv I. Kuz'min of the Vasil'kov Military Air-Technical School suggested a device for checking the degree of charge of storage batteries. Using it, there is no need to unscrew the charge valve. It is small in size, convenient to operate, and permits checking the charge on all makes of aircraft. It cuts time spent on this operation by 40 percent, prevents the early malfunction of the charge valve, and keeps mechanical admixtures from getting into the shock absorber.

Innovators of Chernigov Higher Military Aviation School for Pilots imeni Lenin Komsomol submitted over 60 exhibits, among which was an instrument for checking the parameters of powerful triodes and a universal hydraulic unit for assembling and disassembling aircraft and vehicle wheels.

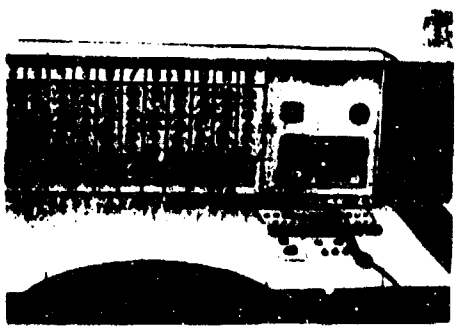


Fig. 4. Main radio training panel

Technical training means were also demonstrated at the exhibit. The attention of conference participants was drawn to long-range radio training ground equipment (Fig. 4) adopted at the Poltava Higher Military Command Communications School at the suggestion of Col I. Belyayev and Sr Sgt (Extended Service) A. Dzherelyuk. Using it, it is possible to supervise radio exchanges, semiautomatically introduce situations, and adjust and set up radio interference on 12 radio channels. Maj A. Losev created a compact, convenient work area for training radio telegraphers. It fully replaces the organic apparatus.

A trainer developed by Engr-Col B. Rukostsev, Capt Tech Serv B. Ivanina, Sr Engr-Lt P. Morozov, and Sr Tech-Lt V. Lavrinenko permits training in the techniques of aerial photography under ground conditions. In addition, with its help it is possible to reveal factors influencing the quality of photos when photographing under varying conditions and modes of aircraft flight. From the processed film it is possible to judge how the speed of flight and time delay affects the displacement of the picture, and how the intervals between shots and flight speed affect the size of the longitudinal coverage.

Good results are obtained in learning on the trainer developed by Engr-Maj N. Kuznetsov. Its purpose is to practice the sequence of performing operations of starting and testing an engine, and also assembly-adjustment work on aircraft. Process charts are used when working on the trainer.

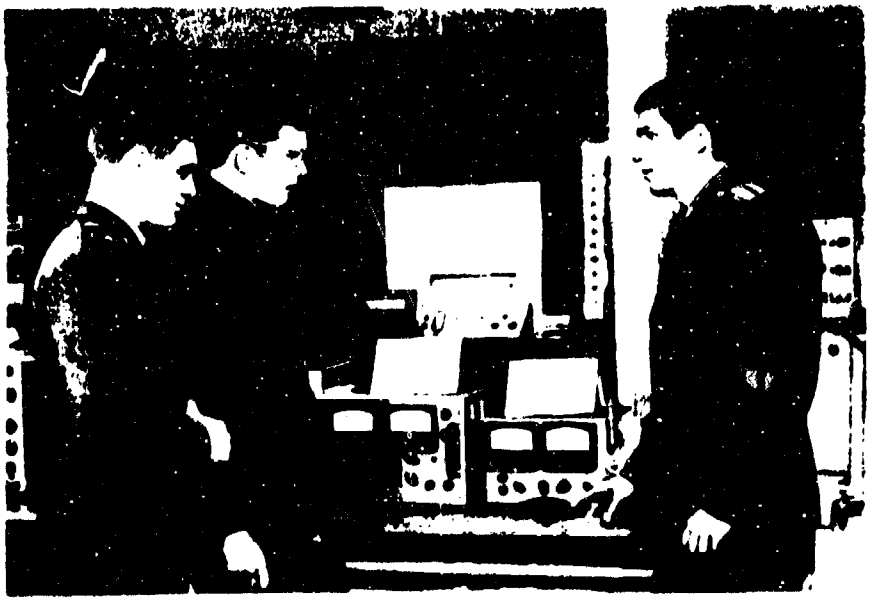


Fig. 5. Engr-Lt P. Ivashchenko explains the design of innovations he developed to Jr Sgt V. Chukhlebov and Pvt V. Kostyrko.

Many were interested by the devices designed to perform various investigations, measurements, prognostication, and control over the operation of a complex apparatus. For example, the Kiev Higher Engineer-Aviation Military School of the Air Forces submitted a device developed by Engr-Lt Col O. Litvinenko, Engr-Capt I. Bondarenko, and Engr-Lt P. Belousov. Using this device, it is possible to make two- and three-dimensional recordings of images using the holographic method, receive and analyze two-dimensional spectra of given images, perform coherent filtration of the signal, and reproduce the initial signal from the recording.

A group of authors from the same school -- Engr-Lt Col V. Kudritskiy, Engr-Maj A. Popov, and Soviet Army employee G. Lazarenko -- produced a predictor of the technical status of a radioelectronic apparatus, operating in an automatic or manual mode. The principle of its operation is that a measured parameter value is sent to the input of the instrument in absolute or relative units, and a value of this same parameter is received at the output at subsequent instances of time. Prediction error does not exceed 10 percent.

A graduate of the Kiev Twice Red-Banner Higher Military Engineer Communications School imeni M. I. Kalinin, Engr-Lt P. Ivashchenko, who has been awarded the bronze medal of VDNKh SSSR [Vystavka dostizheniy narodnogo khozyaystvo SSSR; Exhibit of achievements of the USSR national economy] for participation in the Central Exhibition of Technical Creativity of Youth (dedicated to the centennial of Lenin's birth), is the author of two new developments submitted to the exhibit. One is designed for comparative testing of various ignition systems of internal combustion engines, and the other is for measuring thyristor parameters (Fig. 5).

The numerous exhibits demonstrated at the exhibition attest to the variety of real problems being resolved by innovators and inventors of the district. As we have already noted, there were around a thousand of such exhibits. Over 120 of the more valuable developments were picked for broad adoption by district troop units.

The conference and exhibition will aid in further increasing the creative activeness of district innovators.

REQUESTS

Request Nr 26: Lt Col L. Petukhov: I would like to become familiar with the design of a device for checking skills in driving and in determining the reaction time of drivers. We need such a device for training young drivers.

Request Nr 27: Maj V. Popov: We are interested in a universal instrument by which it would be possible to locate damage in VHF and short-wave apparatus. It should be small and portable.

Letter to the editors from Lt Col P. Gabalin: In the request section we find the necessary information, which eliminates the need to resolve tasks which have already been fulfilled.

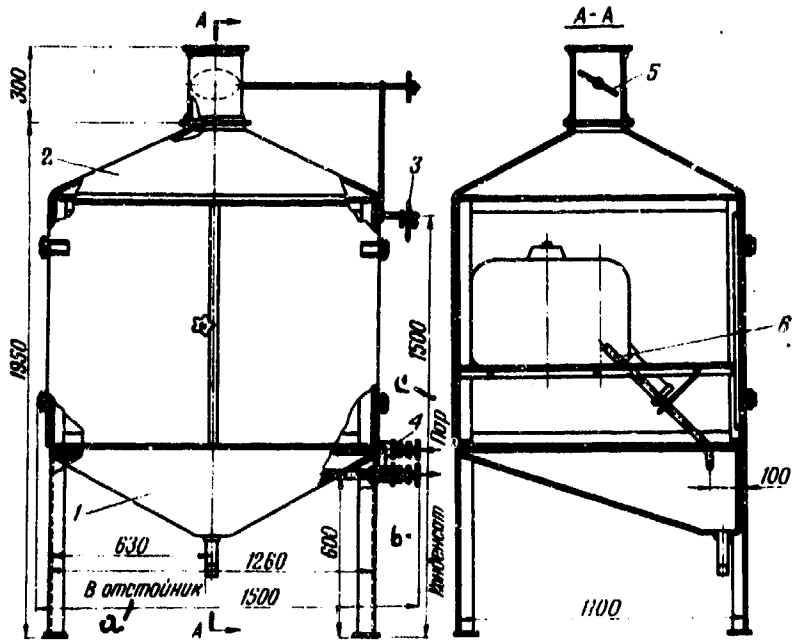
For a long time we were engaged in a search for the most optimal method of determining the average speed of movement of combat vehicles. Using the answers to the request of Lt Col M. Ivanov, published in the March and June issues of 1971, we made and tested two models of a straight-edge proposed by Lt Col Yu. Rudchenko. It satisfied us, and we are now making a set of such straight-edges.

Request Fulfilled:

Lt Col L. Zelkin (No 5, 1971) was interested in devices or methods for washing inner surfaces of fuel tanks of engineer equipment without using corrosive materials.

Soviet Army employee M. Zil'bergleyt reported on such a device for washing fuel tanks of MAZ-200 and ZIL-164 vehicles. Using it, heated steam is passed through the vehicle tanks and they are then washed with water.

The device (see sketch) allows normal working conditions and prevents humidifying the air and moistening the walls with steam. It is a cabinet with two doors, a hood (2), and tray (1). In the upper part of the cabinet is mounted an exhaust damper (5) 200 mm in diameter, connected with the ventilation exhaust pipe. The damper control is manual, using handle (3).



KEY: a -- to sump; b -- condensate; c -- steam.

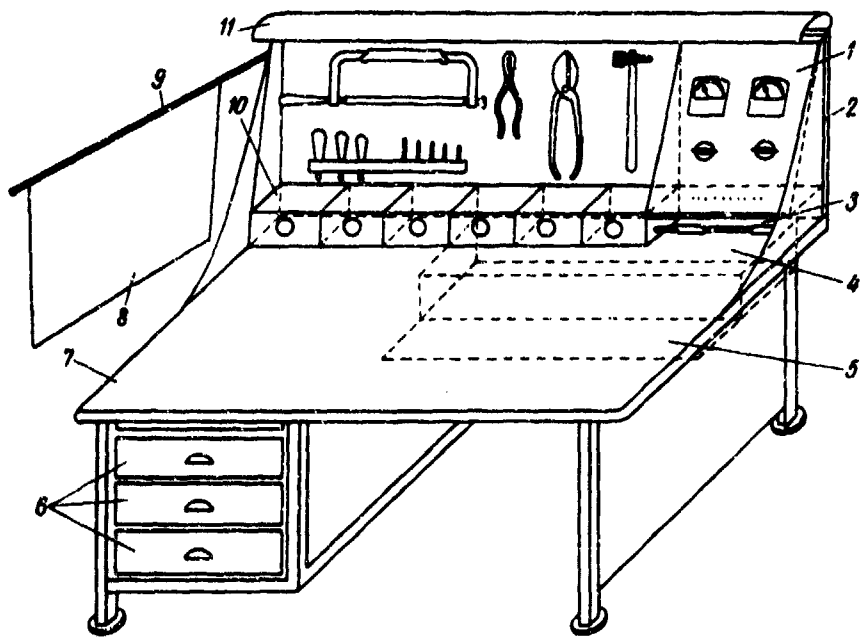
The tray of 1-mm thick sheet steel is welded to the lower part of the cabinet and serves to collect and drain off water and condensate through the outlet. To the side and rear the cabinet is covered with sheet steel 1 mm thick. To prevent corrosion, its exterior is covered with KhSG-25 primer and KhSE-23 enamel and the interior is covered with primer EP-0010 and enamel OEP-4171.

Steam and water enter the tank through pipes (4) via connection pipe (6), which is inserted into the inlet hole. The amount of steam and water is regulated using vents. The tank is placed into the cabinet with the inlet hole down, and all plugs and connections must be unscrewed.

In operating the device, it is necessary to periodically clean the tray of dirt and resins so that inflammable substances do not gather there, and to check the seal of pipes.

The device is simple to build and can be made by a repair enterprise.

INNOVATORS' RELAY



Engr-Capt 2nd Rank Yu. Komarov developed a unified work position for a radio technician and electrician, where not only individual parts are uniform, but the entire design as well, including overall size.

The sketch shows it set up for electrician work. This area is a table of welded steel angle pieces with a size of 1300x700x800 mm. With it is a bracket with a hinged joint, a fan, and a rotating chair. On the table-top (7), which is covered with plastic, bolts secure a tool and instrument stand (2) 1300 mm wide and 600 mm high. In this instance the stand has panel (1) with instruments, tools necessary for work, drawers (10) for small tools and parts, hood (11) which usually contains a curtain, holder (9) with board (8) for a drawing, and support (3) for a soldering iron and crucible.

In drawers (6), mounted in the table, are kept parts and technical documentation. Under the tabletop is drawer (4) (for electric drills and vises), the top of which (5) can be used as a shelf.

Inasmuch as the work of an electrician has much in common with that of a radio technician, the latter's work area retains the basic elements of this table designed for the electrician. There is a change only in the outfitting of the tool and instrument stand, and to the side of the stand and table top are secured four additional shelves.

Considerable means are not required to manufacture the equipment of the suggested work areas, as many parts are unified.

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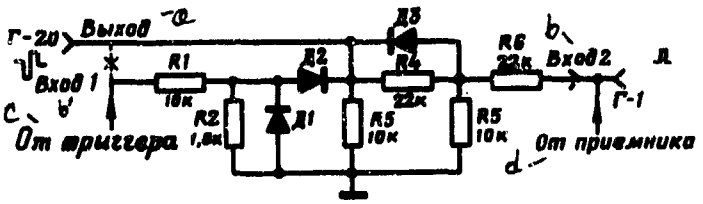
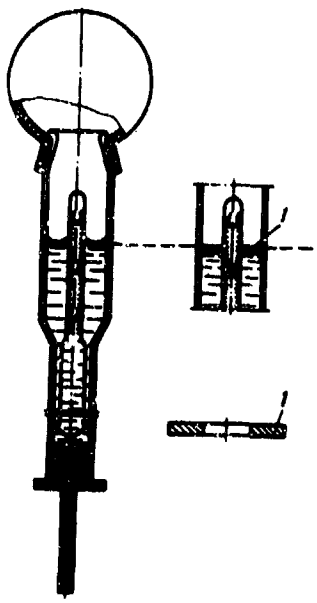


KEY: a -- output; b -- input; c -- from trigger; d -- from receiver.

The time needed to tune a radio-relay station can be reduced with the help of a device created by Engr-Lt Col Ye. Shterngarts. It simplifies the process of supervising the adjustment of the phase in the synchronization unit. The device is an additive circuit with six resistors and three diodes. Pulses taken from the trigger (meanders) are sent to Input 1, and pulses from the receiver are sent to Input 2. The circuit output is connected with jack G-20. Resistors R1 and R2, R5 and R6, form voltage dividers, and are selected so that the necessary value of sum output voltage is obtained. There is no requirement to perform any additional adjustments in the oscillograph unit. In adjusting phase, pulses from the receiver are placed in the middle of the "brackets." The entire additive circuit is contained on a pertinax card 30x 50 mm and can be secured to the front panel of unit 210.

* * *

To measure the density of electrolyte in storage batteries, it is convenient to use the device proposed by Engr-Lt Col Ye. Anishchik and Engr-Capt V. Kavun. It consists of ring (1) 1 mm thick, made of cellular plastic and mounted on a float. It moves freely within the glass bulb. When the bulb is filled with electrolyte it floats together with the float. Density readings are made with the help of the ring according to the float graduations.



To ensure that the ring does not move on the float, electrolyte is taken in carefully, without abrupt jerks.

* * *

As reported by Engr-Lt Col A. Ageyev, dummy antenna-feeder devices of transmitters and receivers serve in training radio-relay technicians. With their help it is possible to set up damping equivalent to that introduced by an actual line and of almost any length. This permits conducting classes both at stations set up in two neighboring classrooms as well as in mobile stations at a distance of 10-15 meters from each other. When it is necessary to set up one communications link, one dummy is hooked into the transmitters and receivers of two stations in place of the actual cumbersome antenna-feeder devices. When it is required to have several links we use the appropriate number of dummies. With the help of dummies it is possible also to set up a radio-relay line of communications.

The dummy is a rectangular body with a size of 150x150x80 mm, within which are placed two rods on each wall. They are insulated from the body. Graphite powder or activated carbon from old gas mask canisters is poured into the body. Each rod is insulated from the carbon by a vinyl chloride tube and is welded to a high-frequency socket, to which is hooked the RK-1 coaxial cable. The central conductor goes to the rod, and the braid to the body.

To adjust the value of the attenuation introduced, holes are drilled in the center of opposite sides of the dummy body and bolts with washers

are inserted. By tightening or loosening the nut, pressure on the powder is either increased or reduced, and as a result attenuation changes within limits which ensure a level of high-frequency oscillations in the receiver preselector of any value, right up to zero, i.e., until communications are disrupted. The dummy practically does not radiate electromagnetic energy into the surrounding area, since it is closed and a coaxial cable is used. This permits setting up several communications links which do not affect each other, and making freer use of the entire range of station frequencies.

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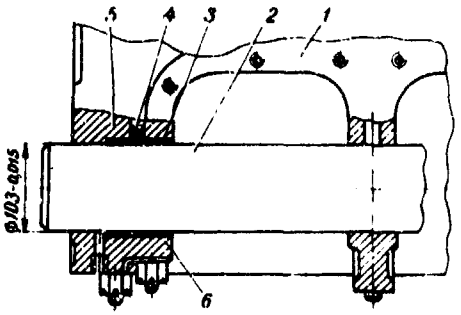

Soviet Army employees V. Zhavora, S. Goncharov, and I. Dorofeyev proposed to use a plunger gauge to restore the epoxy compounds of the bed for main bearing bushings of KDM-100 engines. The unit (1) to be repaired is placed on a support. The surface of the bed (5) of the bushing and cap (6) is cleaned of dirt and carefully degreased with white spirit. A wad (4) of rags or asbestos is used to stop up the oil channel.

Plunger (2) is wiped dry and the segment coming into contact with resin is wrapped with oiled cloth. Then epoxy compound (3) is put onto the worn surface of the bed and cap. The compound includes 25 grams of ED-6 resin, 5 grams of dibutylphthalate, 50 grams of iron powder, and 2.5 grams of polyethylene polyamine. It is rubbed in carefully. Having placed the plunger into the beds of the main bearings, the caps are put on and nuts tightened in conformity with technical conditions. In 20 hours -- the time necessary for the compound to harden -- the plunger is removed, a punch is put into the beds, and holes are reamed for the delivery of oil. After this the plug is removed from the oil channel. After removing excess resin and shavings, the channel and block beds are blown out with compressed air.

* * *

It is possible to replace the magnetic element with eight pins in a printed circuit by using the device proposed by MSgt (Extended Service) L. Ivanov. A copper sleeve is mounted on an ordinary soldering iron, with eight

lobes on the sleeve. The latter are bent in such a way that the distance between their ends is equal to the distances between corresponding pins of the magnetic element. With the aid of such a device, the electrician welds all eight pins immediately without overheating the printed circuit.

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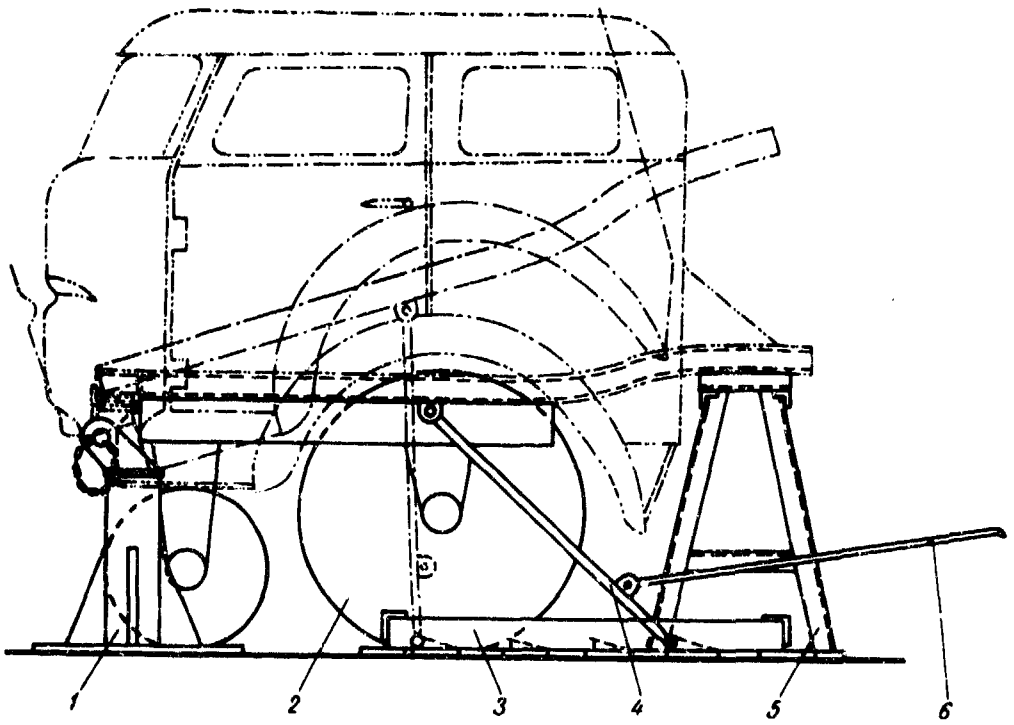

Innovators of a repair enterprise created a stand facilitating repair of MAZ-500 cabs.

It allows the cab to turn 60 degrees (with detents every 10 degrees) about the axis of attachment of the forecarriage. It consists of two front support stands (1), a holding device (3), support rod (4) with end roller, and rear support (5). Design of the front support stands permits securing the cab by using the holes in its brackets. In a horizontal position the cab is set on support (5). The necessary tilt of the cab is provided by means of a jib. At the moment the cab is raised, the support rod, turning about the axis of the lug of the limit stop, slides along the blocks of the holding device. As soon as the cab assumes the required position, it is locked. To lower the cab it is raised slightly, and with the aid of lever (6) the rod is pressed to the upper part of the body of the holding device.

The cab is transported to the stand on a special trolley (2), design of which also allows placement of the cab on the stand. The trolley's front

axle is rotatable. On the platform are special holders which provide for stability of the cab during transport.

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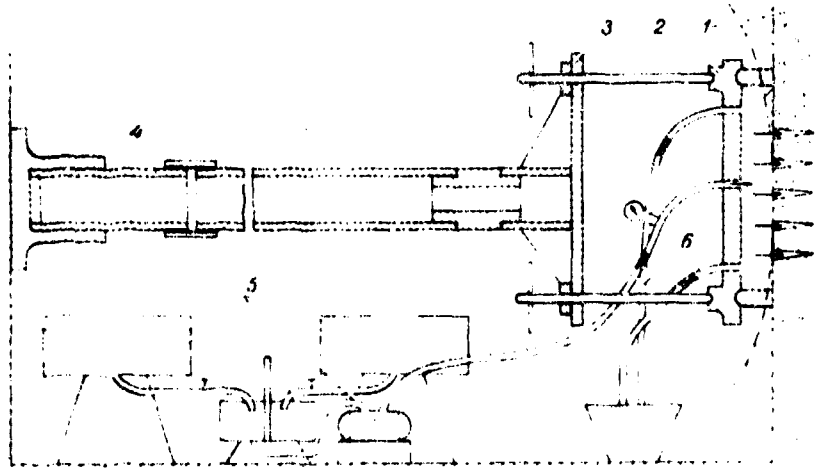

A device for packing concrete (author's certificate No 275098), invented by Engr-Col M. Boyko and Engr-Lt Col P. Zubakin, provides rapid and reliable sealing of the pressure plate on the enclosing structure of buildings.

It consists of the structure to be packed (1), pressure plate (2), end plate (3) of the tubular support through which screw jacks pass which press the plate (2), tubular telescopic support (4), a system of tanks (5), a pump or source of compressed air, a sealed tank for delivery of solution behind the pressure plate, and pipe connectors (6) for draining air and solution from under the pressure plate.

The device works as follows. Two or three men mount the pressure plate on the structure and using the telescopic support and screw jacks secure it in a working position. After this they attach the delivery and drain pipes with cock plugs to the pressure plate and begin to deliver the plugging solution into the structure under pressure. The pressure plate is sealed on the structure by sequential tightening of the screw jacks.

NOTEBOOK ENTRIES

Soldering

This is a method of joining two or more metallic or metallized parts by means of a bonding metal or alloy (solder), the melting temperature of which is below that of the parts being joined. The process consists of the following. Melted liquid solder is introduced between the heated metals to be joined. On cooling it hardens and firmly bonds the parts. Before soldering, the touching surfaces are cleaned of dirt, grease, and oxidized layer. To remove the oxide film formed on the metal during soldering, and to create the necessary conditions for wetting the metal with the solder, we use special chemical substances called fluxes. There are two types of flux: acid and nonacid. In cases where after soldering it is impossible or difficult to clean the part of the remains of flux (for example, during electrical work), soldering is accomplished with nonacid flux to avoid intensified corrosion of the metal at the soldered places. Use of this flux should be stipulated in drawings or the TU /tekhnicheskiye usloviya; specifications/ for the articles.

Depending on temperature of melting, all solders can be divided into those easy to melt (with a melting point up to 400 degrees Centigrade) and hard to melt (with a melting point over 400 degrees).

Solder methods

The following methods of heating are employed when using hard solders:

a -- in a hearth;
b -- immersion in melted solder;
c -- in salt baths, the temperature of which must be somewhat higher than the melting point of the solder;
d -- by the electrical method using an electrical contact apparatus;
e -- with the flame of a gas torch;
f -- high frequency currents;
g -- in ovens.

Choice of a particular method of heating depends basically on the series of the parts to be soldered, on their size and design, and on the requirements placed on joining the parts in relation to the cleanliness of the seam and filling the gap with solder. Thus, parts which warped on being heated with a gas flame were soldered successfully and without warping when heated in ovens. In many instances the best results are given by heating with induction currents.

High-Melting Solders (Hard)

The high-melting, or hard, solders include those with a melting point over 400-500 degrees Centigrade.

Copper-zinc solders cannot be used for soldering parts subjected to shock loads or vibrations due to their brittleness. These solders are used to join parts bearing only a static load.

When joining steel parts, the most accessible high-melting solders are pure copper and brass L62 and L68. Connections soldered with brass, and with observance of the temperature conditions, possess higher durability in relation to copper solder and can be subjected to considerable deformations. They also possess higher plasticity. Overheating of brass solders causes the zinc to vaporize, which deteriorates the mechanical properties of the connection. (Inasmuch as zinc vapors are poisonous, it is necessary to preclude the possibility of inhaling these vapors on the part of the solderer!)

Solder on a copper base of the LOK (tin-siliceous brass) type contains small additives of silicon and tin, which reduces the vaporization of zinc and increases the flowability of the solder, thus ensuring a higher density and tightness of the seam.

Low-Melting Solders (Soft)

The most widespread of the low-melting solders are the tin-lead, which consist of lead and tin in different ratios. Sometimes, in addition to lead and tin, bismuth and cadmium are introduced into the alloy, which lowers the melting point, or antimony, which increases the durability of the seam.

In instrument-making soldering with soft solders is employed in electrical assembly work to join wires with electrical leads and for other such connections.

Retention of the tightness of soldered seams for articles subjected to vibrations can only be considered reliable if there is a rigid mechanical connection between the parts joined.

Soft solders should not be used to connect parts bearing a load or subject to acceleration forces arising with shocks or vibrations, or which operate at a temperature over 100 degrees Centigrade. Parts can be joined with soft solder only in individual cases when the mechanical forces acting

on the soldered place are small and the area of contact of the parts connected by the solder is sufficiently large.

In all cases of using soft solders, the touching surfaces of parts to be soldered are blanched beforehand to accelerate the process and obtain a more reliable connection.

Solders: Physical Properties and Chemical Composition -- Silver (GOST 8190-56)

a Наименование и марка припоя	b Удельный вес, г/см³	c Удельное электросопротивление, ом·см/см	d Химический состав в %					j Примеси, не более
			e серебро	f медь	g олово	h цинк	i кадмий, сэнец и др.	
ПСр72	9,9	2,2	72	28	—	—	—	0,25
ПСр50	9,3	2,5	50	50	—	—	—	0,25
ПСр70	9,8	4,2	70	26	—	4	—	0,5
ПСр65	—	—	65	20	—	15	—	0,5
ПСр45	9,1	9,7	45	30	—	25	—	0,5
ПСр25	8,7	6,9	25	40	—	35	—	0,5

Copper-Zinc (GOST 1534-42)

a Наименование и марка припоя	b Удельный вес, Г/см³	c Удельное электросопротивление, ом·см/см	d Химический состав в %					j Примеси, не более
			e серебро	f медь	g олово	h цинк	i кадмий, сэнец и др.	
ПМЦ36	7,7	—	—	36	—	Остальное	—	0,6
ПМЦ48	8,2	—	—	48	—	"	—	0,6
ПМЦ54	8,3	—	—	54	—	"	—	0,6

KEY: a -- designation and make of solder; b -- specific gravity, g/cm³; c -- specific electrical resistance, microohms/cm; d -- chemical composition in %; e -- silver; f -- copper; g -- tin; h -- zinc; i -- cadmium, lead, etc.; j -- admixtures, not over.

VOYENIZDAT FOR THE READERS

Col P. Kukushkin, Deputy Chief of Military Publishing House

The CPSU constantly fixes its attention on questions of military formation. Theoretical and ideological-political problems of military formation in light of the decisions of the 24th Party Congress will find expression in a number of works in the topical schedule of the Voyenizdat in 1972, such as Voprosy nauchnogo rukovodstva v Sovetskikh Vooruzhennykh Silakh (Questions of Scientific Leadership in the Soviet Armed Forces), Leninskiye normy -- zakon zhizni armeyskikh partorganizatsiy (Leninist Norms: Law of Life of Army Party Organizations), V. I. Lenin o vospitanii sovetskikh voinov (V. I. Lenin on the Education of Soviet Soldiers), and Druzhba narodov -- istochnik mogushchestva Sovetskikh Vooruzhennykh Sil (Friendship of Peoples: Source of Might of the Soviet Armed Forces).

We plan to publish literature dedicated to the activity of political organs and Party organizations in putting into effect the decisions of the 24th CPSU Congress: Osnovnoy zakon partiynoy zhizni (Fundamental Law of Party Life) -- on demands of the CPSU Rules placed on Army and Navy Party members, Sputnik partiynogo aktivista (Party Activist's Companion), Komsomol'skaya rabota v Sovetskoy Armii i Flote (Komsomol Work in the Soviet Army and Navy), and Spravochnik propagandista i agitatora armii i flota (Guide for the Propagandist and Agitator of the Army and Navy). For political workers of companies, batteries, and podrazdeleniye which are equivalent there will be the texts Zamestitel' komandira roty po politchasti (Deputy Company Commander for Political Affairs), Spravochnik politrabotnika podrazdeleniya (Guide for Podrazdeleniye Political Worker), Vospitaniye bditel'nosti (Instillation of Vigilance), Polevaya vyuchka voysk i politrabota (Troop Field Training and Political Work), and others.

An important place in the schedule is given to literature on questions of political and military education. In the series "For the Soldier and Sailor on the Revolution in Military Affairs," there will be published brochures entitled "Discipline: Guarantee of Victory," and "The Time Factor in Contemporary Combat." The books Poveliteli strategicheskikh (Strategic Sovereigns), Serebryanyye kryl'ya (Silver Wings), Vernost' dolgu

(Loyalty to Duty), and others show the combat service of soldiers of different combat arms and branches of the Armed Forces.

Literature on tactics is represented by the books Motostrelkovyy batal'on v boyu (Motorized Rifle Battalion in Combat), Tankovyy batal'on v boyu (Tank Battalion in Combat), and Batal'on v morskom desante (The Battalion in Amphibious Assault). The book Razvedka v boyevykh primerakh (Reconnaissance in Combat Examples) reveals methods of operation of reconnaissance podrazdeleniye (groups) during the Great Patriotic War, the demands on reconnaissance and personal qualities of scouts whose deeds are immortal.

The scientific-technical revolution in military affairs set for officer cadres the task of mastering the fundamentals of scientific control of troops. In the book by V. V. Druzhinin and D. S. Kontorov, Ideya, algoritm, resheniye (Idea, Algorithm, Solution), designed for commanders at all levels, staff officers, instructors, and engineers working in the field of control automation, examines the possibility of employing technical means in combat practice. The book by V. D. Skugarev and K. O. Dubravin, Nauka upravleniya i flot (The Science of Control and the Navy), tells about the organizational structure of control, the fundamental forms of management work, and methods of its norm setting, and gives certain methodological recommendations for improving the organization of this work in the Navy.

The new year will see a continuation of publication of books on missile technology, radio electronics, and electrical engineering. Among them are the fundamental works Ballisticheskaya raketa na tverdom toplive (Solid Fuel Ballistic Missile) and Fizicheskiye osnovy raketnogo oruzhiya (Physical Fundamentals of Missile Weaponry), which contain much useful information for students of higher schools and for officers connected with operation of missile weaponry. The book Osnovy raketnoy tekhniki (Fundamentals of Missile Technology), written from materials of open-source native and foreign press, is designed for enlisted men and NCOs. It familiarizes the reader with the history of development of missile technology, the design of jet engines, rocket fuel, and explosives, and gives general information about surface-to-air missiles and their use. A popular exposition of questions of preparing ballistic missiles for combat employment is given in the book Podgotovka k pusku i pusk raket (Preparations for Launch and Launch of Missiles).

The brochure by N. K. Stupakov entitled "Safety in Operation of Missile Weapons" tells of the measures ensuring safety in the process of producing missiles and in operating them in troop chast'.

The readers interested in achievements of contemporary technology will find use in the brochure by A. D. Bogdanov entitled "Gyroscopes on Lasers." In popular form it examines the principles of operation of gyro instruments, lasers, and the laser gyroscope, and gives examples of their practical use.

The book by Yu. S. Denisov Osnovy radiotekhniki (Fundamentals of Radio Technology) is designed for enlisted men and NCOs. Readers can find information about principles of radar and radio communications, electrovacuum

and ion instruments, rectifiers, valve amplifiers, and pulse voltage generators. Here too is told briefly about oscillating systems and radio transmitting and receiving devices. Attention is given to the physical essence of phenomena examined.

Those studying electrical engineering are recommended the book by G. M. Knyazhitskiy Osnovy elektrotekhniki (Fundamentals of Electrical Engineering), which examines in detail the fundamental laws of direct current, the electrical field and capacitance, magnetic field and electromagnetic phenomena, alternating current, transformers and electrical machines, and electrical measurement instruments. The book contains a number of reference materials needed in practical work.

The books by M. V. Verzunov Odnopolosnaya modulyatsiya v radiosvyazi (Single-Band Modulation in Radio Communications) and the group work Impul'snyye skhemy na poluprovodnikakh i ferritakh (Pulse Circuits of Semiconductors and Ferrites) are addressed to various categories of signalmen. The first describes methods of increasing the effectiveness of single-band signals, multichannel operation in single-band transmitters, and certain questions of operating single-band radio stations. The second describes principles of constructing pulse circuits, physical processes in the circuits, working out basic versions of circuits, and their practical use.

The book by A. I. Paliy Radioelektronnoye protivodeystviye (Radioelectronic Countermeasures) uses material published in native and foreign press. The author shows the role and importance of radioelectronic means in contemporary armed forces in conducting reconnaissance and providing control of means of armed warfare. It examines the characteristics of jamming radioelectronic means, radar camouflage, the effect of nuclear bursts on radioelectronic means, and the organization of radioelectronic countermeasures in combat operations.

Next year the readers will receive a number of publications on aviation, cosmonautics, and naval affairs.

The book by I. I. Andrukhov is devoted to questions of the use of helicopters in armed warfare. A. S. Korovkin tells about the control, orientation, and stabilization of space objects.

Aviation specialists will find use in the book Samolet i prirodno-klimaticheskiye usloviya (The Aircraft and Natural Climatic Conditions), in which the authors analyze the influence of the surrounding medium on the technical condition of contemporary aircraft, and the features of operation under different climatic zones of a glider, an engine, electrical and radio equipment, instruments, as well as ground maintenance equipment. They tell of the features of storage and use of fuels and lubricants and pressure fluids.

The translation Samoletnyye navigatsionnyye sistemy (Aircraft Navigational Systems) characterizes contemporary means of supporting flights, and shows the ways to further develop them. It examines aircraft electronic

computers used to solve navigational problems, autonomous radionavigation and doppler gear, and also ground scanning sets.

Boyevoye ispol'zovaniye avianostsev (Combat Employment of Aircraft Carriers) and Avianostsy i vertoletonostsy (Aircraft and Helicopter Carriers) are the books in which one can find the combat characteristics of ships of this type, and information on their combat use in the past and present. The book Sistemy, pribory i ustroystva podvodnogo poiska (Systems, Instruments, and Devices for Underwater Search), written by a group of authors, generalizes the achievements of the last few years in the field of creating devices for detecting objects on the bottom of seas and oceans. It describes systems of underwater search operating on different physical principles. It briefly examines methods of determining the effectiveness of various systems of underwater search.

The book by V. I. Gorelov Ekspluatatsiya gazoturbinnykh ustanovok (Operation of Gas Turbines) is calculated for a wide range of readers involved in operating and repairing gas turbines. It can also serve as a training text for gas turbine operators. "Diver's Guide," published in pocket format, will be useful to persons engaged in emergency rescue work. It is also of interest for those who are engaged in underwater research and underwater sport.

Many sailor readers will be interested in the guide to native maritime toponymy, "The Sea Chart Tells," which lists 2400 maritime toponyms and reveals the origin of names of geographic objects and by whom, when, and in honor of whom (or what) they were named.

The book by a group of authors entitled Pravila strel'by iz strelkovogo oruzhiya i granatometov (Rules for Firing Small Arms and Grenade Launchers) sets forth and justifies the rules for firing against ground and air targets which are common for all types of contemporary small arms, as well as rules for firing hand-held antitank grenade launchers.

Much attention in the topical schedule for 1972 is devoted to publication of training, methodological, and reference literature. Spravochnik po voyennoy topografii (Guide to Military Topography) is being published in a mass printing. It contains information about topographic maps, aerial photos, tactical attributes of terrain, and methods of studying it. Here too are data on means of orientation, methods of orientation and target designation on the terrain, and techniques of making graphic drawings. It also gives samples of topographic maps, conventional signs and abbreviations used on maps, and other reference information on military topography.

The text Metodika stroyevoy vyuchki (Methods of Line Training) offers recommendations on methods of training servicemen in techniques of individual drill and in shaping up podrazdeleniye. It tells of the procedure for conducting an inspection in ranks. The Uchebnik voyennogo voditelya vtorogo klassa (Textbook for Military Driver Second Class) reveals the design, operation, and procedures for maintaining mechanisms, assemblies, and instruments of the ZIL-131, ZIL-157K, Ural-375, KrAZ-255B, GAZ-66, and GAZ-69 vehicles. Special

sections of the textbook gives necessary information on organizing the operation and driving of individual vehicles and vehicle columns under varying climatic and road conditions.

One can take advantage of the combat capabilities of the tank wisely and effectively only with an excellent knowledge of the design and operation of the equipment, and the rules for its operation and maintenance. Officers of tank and motorized rifle podrazdeleniye and students of military schools will be helped here by the Uchebnoye posobiye po tekhnicheskoy podgotovke tankistov (Training Aid on Technical Training of Tankers).

In the collective work entitled Podrazdeleniya inostrannykh armiy (Small Units of Foreign Armies), the authors examine the organization of infantry (motorized infantry), tank, and artillery podrazdeleniye of the ground forces of the USA, Great Britain, and the FRG. They describe the weapons and combat equipment of these podrazdeleniye and their employment.

The topical schedule of the publishing house also includes literature on civil defense. Nine books and brochures tell of the destructive effects of mass destruction weapons of armies of capitalist states and of the various measures of protecting the populace against them.

The publication of dictionaries, visual aids, and posters continues. A large number of books of fiction, military history, and memoirs has been readied for publication. It would be impossible to list them all, but even from the books and brochures named one can see that our reader will receive many interesting and useful books in the next year.

The collective of the Order of Labor Red Banner Military Publishing House of the USSR Ministry of Defense attentively studies the critical remarks and suggestions of its readers and strives to improve both the content and the format of published books. It is focusing its attention on resolving the tasks set before workers of the press by the 24th CPSU Congress.

MEANS OF ORGANIZATIONAL TECHNOLOGY

Lt Col I. Kudryavtsev

Adoption of the latest technology in planning and control of production activities is now viewed as an absolute condition for further development of the national economy. To increase the effectiveness of production we must create favorable conditions for labor, set up convenient work areas, determine and adopt optimal technological processes, and establish the necessary means of labor mechanization in all spheres, including the sphere of control.

Organizational technology helps solve these problems. This is a new and rapidly growing field of science and technology. With its development there began mass production and adoption of various instruments and devices which mechanize management work. The nomenclature of means of mechanizing mental labor encompasses a large range of articles from the ballpoint pen and mechanical pencil to the input and output devices of electronic computers. A new reference catalogue helps in delving into this multiplicity of useful things and selecting the most suitable.[1] It examines the fundamental means of organizational technology put out by industry in our country and the countries belonging to SEV [Sovet ekonomicheskoy vzaimopomoshchi; council of economic cooperation]. The reference is designed for engineer-technical workers, students, and workers of NOT [nauchnaya organizatsiya truda; scientific organization of labor]. It will undoubtedly also be useful for servicemen who make use of various technical means in their work.

In our country means of mechanizing engineer-technical and management work are usually broken into two major groups: means of computer technology and means of organizational technology.

The latter include devices and instruments connected with creation of textual, graphic, blueprint, and other documentation, with the processing and

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[1] Burtsev, V. V. and Kaplan, E. B. Sredstva orgatekhniki (Means of Organizational Technology). Moscow, "Ekonomika" Publishing House, 1971, 103 pages, price 38 copecks.

operational reproduction of documents, with ensuring their long-term storage, and also control communications and dictaphone apparatus.

Modern technology possesses not only individual mechanisms, but also systems of technical means designed for mechanization of varied fields of management labor. The reference is called upon to help mechanize engineer-technical and management labor in the accomplishment of NOT measures.

The first chapter examines means of compiling documents. These include typewriters, all kinds of devices which increase the labor productivity of typists, and dictaphone equipment.

The second chapter is devoted to means of duplicating and copying documents. It tells of the means of light-, photo-, and thermocopying, and electrographic, electrostatic, and electronic copying. It also tells of different kinds of equipment for offset, stencil, and hectographic printing and the means for microphotocopying.

In the third chapter the authors tell of the means for processing documents -- devices for cutting, binding, and gluing documents, means for placing protective covers on them, and devices designed for destruction of papers, for stamping, and other operations.

The fourth chapter is devoted to means of storing, seeking, and transporting documents. The fifth chapter cites the technical characteristics of means for drawing work and calculating operations, while the sixth examines means of signalling and information.

The reference catalogue ends with recommendations for selecting furniture and equipment for offices.

WEAPONS OF THE JAPANESE ARMY

Engr-Col A. Latukhin

Article 9 of the Japanese Constitution adopted in 1947 states that this state "rejects for eternity the threat or use of an armed force as a means of resolving international disputes," and therefore the country "will henceforth not create ground, naval, or air forces, or any other means of warfare."

However the facts show that the cruel lesson of WWII, which led the Japanese people to countless disasters and tragedies of the first nuclear bombing in the history of mankind, was of no benefit to the shameless reaction and militant militarists. With the direct complicity and assistance of the USA in violating constitutional provisions, the military-industrial complex of Japan nurtures far-reaching plans for militarization of the state, including the production of nuclear weapons.

Beginning in 1957, Japan has been systematically building up its military potential, having already accomplished three five-year military programs. Particular attention is given to outfitting the forces with the latest weaponry and to training command cadres for purposes of creating a basis for developing a mass army.

Until recently the Japanese Army was basically equipped with combat equipment of American manufacture. Now a trend has been noted toward development of their own weapons. For example, the third military five-year program allocated around 1,000 billion yen for purchase of combat equipment of native manufacture. The plan for 1972-1976 provides for further development of deliveries of all types of weapons and combat equipment for the so-called "qualitatively new" Japanese Army. It is planned to strengthen the Navy, outfit the Air Force with the latest model aircraft, and develop the production of missile weaponry. Considerable attention is being given to rearming the ground forces. Below are brief summaries of the main models of weapcnry with which the ground forces of the Japanese Army are being equipped.

Small arms (Table 1). The American 11.43-mm pistol model M1911A1 and two models of pistols of Japanese manufacture are used. The 9-mm Nambu 57

pistol is similar in design to the American pistol, but is shorter and lighter. The 7.62-mm Nambu 57B pistol is similar to the American Browning pocket pistol in design.

TABLE 1

Model	Weight, kg	Overall length, mm	Barrel length, mm	Magazine capacity
7.62-mm Nambu 57B pistol	0.59	156	87.3	8
9-mm Nambu 57 pistol	0.96	200	118	8
7.62-mm "64" automatic rifle	4.53	990	457	20
7.62-mm "62" common machinegun	10.4	1194	457	--
9-mm submachine gun	3.36	762	-	--

The Japanese submachine gun (9-mm, "Parabellum" cartridges) is similar to Swedish models of this weapon. Foreign specialists note that it is reliable in handling and simple to manufacture. The sufficient weight and low rate of fire -- 600 rounds/min -- provide for a good accuracy even when firing long bursts. The new 7.62-mm model "64" rifle also received a fair evaluation. It allegedly possesses a high accuracy when firing at all practical combat ranges. It is heavier than similar American models, but is shorter and therefore is more convenient to use. It can be used for either automatic or semiautomatic fire with a closed breech. In case the barrel gets very overheated, the bolt is withdrawn to the rear position, which allows for more rapid cooling of the weapon. The rifle is designed for using not only standard cartridges used in NATO armies, but also other ammunition used in the armies of the USA, Great Britain, and a number of other countries. The 7.62-mm "62" common machinegun is just as universal. It has a belt feed and is supplied with a bipod or tripod with antirecoil device. The barrel is interchangeable and is air-cooled.

The main weapon of the infantry sections (squads) remains the 7.62-mm American machinegun M1918A2.

Antitank weapons. To combat tanks there are antitank rocket launchers (chiefly foreign), recoilless rifles, and antitank guided missiles put out by Japanese industry. The troops are outfitted with a considerable number of 88.9-mm rocket-firing rifles (475 in a motorized rifle division). This rifle weighs 7.5 kg and is 1.5 meters long. Range of aimed fire is 450 meters and it can penetrate 380 mm of armor. Its basic advantages are low cost and simplicity of handling.

Since 1960 the Japanese 106-mm self-propelled SS4 combination gun mount on track chassis (index "60") has come into the inventory. The guns, similar in design to American models, are mounted coaxially in a conical turret of elliptical shape (Fig. 1). The basic load includes finned projectiles with hollow-charge or common action.

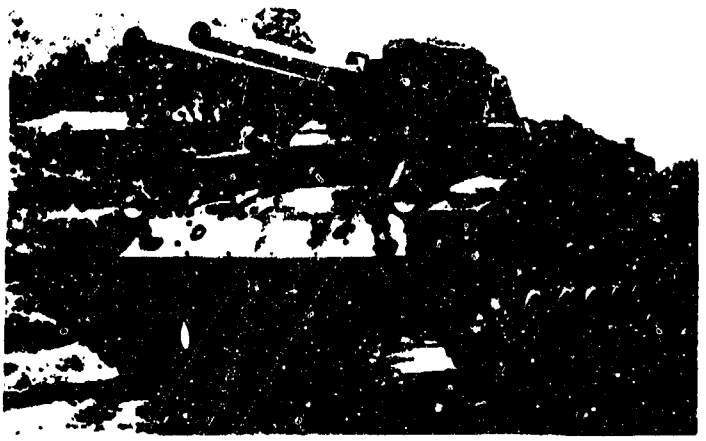


Fig. 1. Self-propelled "60" coaxial recoilless gun

The first models of antitank guided missiles of Japanese manufacture -- the series TATM (MAT) -- appeared at the beginning of the sixties. These include the TATM-1, TATM-3C, TATM-3D, and ATM-2 missiles. All of them have a solid-fuel rocket motor with two tractive modes, a warhead with high-explosive loading, a system of wire control with gyroscopic instruments on board, and cruciform fins. The design of the TATM(MAT) missiles reminds one of the French SS-10 antitank guided missiles (ATGM). They are launched from the ground, from combat vehicles, or from helicopters. They are served by a crew of two. An ATGM battery (12 launchers and 124 missiles) is attached to a division.

Later and more improved versions of the ATGM developed in the second half of the sixties received the index KAM-3D (ATM-64) and TAN-SSM. It has been reported that the ATGM TAN-SSM possesses greater range and will be used both by the ground forces and in the navy.

Artillery and mortars (Table 2). In addition to foreign model guns, the inventory includes 105-mm tracked self-propelled howitzers of Japanese manufacture. The gun is armored. Its crew consists of seven men. On top of the unit is mounted a 12.7-mm machinegun. The army is also equipped with models of the 81-mm and 106-mm self-propelled mortars of Japanese manufacture. They are a modification of the American M29 and M30 mortars, mounted on a Japanese tracked APC "60." The mortar is placed on the floor of the vehicle's combat compartment, from which firing is performed.

TABLE 2

a Наименование образца	j Вес, т	k Экипаж, человек	m Вооружение, n количество / o калибр, мм: p орудия, миномёты	q пулемёты	r Габариты, мм: s длина	t ширина	u высота
b Самоходные установки							
c 81-мм самоходный миномёт «60»	12,1	5	1 / 81	1 / 12,7	4850	2400	1700
d 106,7-мм самоходный миномёт «60»	12,0	5	1 / 106,7	1 / 12,7	4850	2400	1690
e 106-мм самоходное безоткатное орудие «60»	7,6	5	2 / 106	1 / 12,7	3400	2230	1380
f 105-мм самоходная гаубица	.	7	1 / 105	1 / 12,7	4380	2840	2340
g Танки							
h Средний танк «61»	35	4	1 / 90	1 / 7,62	8050	2950	2480
i Бронетранспортер «60»	10	1/9 (неразвозимый десант)	—	1 / 7,62 2 / 12,7	4850	2400	1700

KEY: a -- model designation; b -- self-propelled units; c -- 81-mm "60" self-propelled mortar; d -- 106.7-mm "60" self-propelled mortar; e -- 106-mm self-propelled recoilless gun "60"; f -- 105-mm self-propelled howitzer; g -- tanks; h -- "61" medium tank; i -- "60" APC; j -- weight, tons; k -- crew, persons; l -- assault party carried; m -- weapons; n -- number; o -- caliber, mm; p -- guns, mortars; q -- machineguns; r -- size, mm; s -- length; t -- width; u -- height.

Division AAA is basically designed for firing against low-flying targets and consists of 40-mm guns and self-propelled units (one-tube or twin) of foreign manufacture.

Evaluation tests were performed of the Swiss 35-mm L90 twin antiaircraft gun, which is planned for use together with the "Superfledermaus" fire control system.

Missile weaponry is represented by the RKT-30 surface-to-surface tactical missile system (Japanese manufacture). This is a self-propelled unit mounted on a 5-ton truck. Two guide rails serve to launch the unguided 300-mm missiles to a range up to 25 km. The design and exterior appearance of the unit are similar to the American "Honest John" unguided missile system (Fig. 2).

Beginning with the mid fifties, Japanese firms created a series of experimental models of surface-to-air (SAM) medium-range guided missiles with

the arbitrary designations TLRM-1, TSAM-1, TRAM-2, and TLRM-2, as well as a test model of a troop unit surface-to-air missile designated TMB-0. However, not one of these models were adopted. Until the present time the American "Hawk" surface-to-air missile complex is being used.

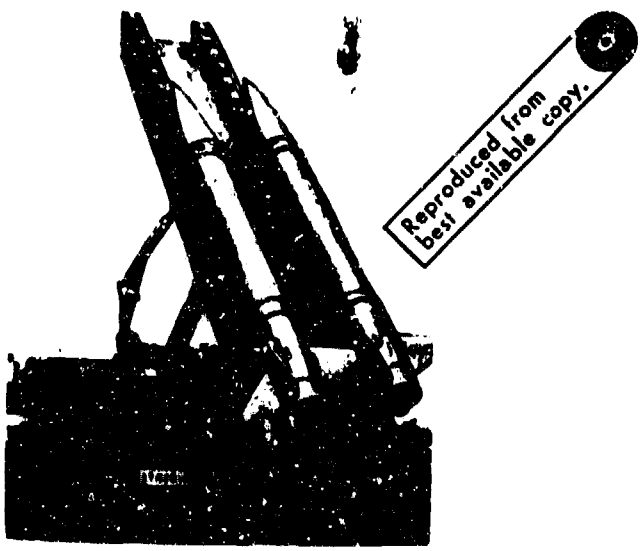


Fig. 2. RKT-30 unguided missile system.

A new surface-to-air guided missile is in the development stage for the ground forces. Its series production is planned for the beginning of the fifth five-year military program (after 1976).

Armored equipment. Along with American light M24 and M41 tanks, since 1961 the inventory of the Japanese Army has included the 35-ton "61" tank with 90-mm gun. At present the firm of "Mitsubishi" has developed a test model of a tank designed to replace the "61" tank. It has received the designation of ST-B. It weighs 38 tons and has a maximum speed of 60-70 km/hr. Its weapons are a 105-mm English gun, coaxial with a 7.62-mm machinegun. Above the turret on a rotating ring mount is a 12.7-mm AA machinegun. The fire control system includes a laser rangefinder, ballistic computer, and devices for gun stabilization. Hydropneumatic suspension permits raising and lowering the vehicle, changing the clearance by 430 mm. The same suspension is designed to change the vehicle's tilt. It is believed that the hydropneumatic suspension will allow achieving smoothness of travel over broken terrain and will increase accuracy of firing. The tank has a lowered silhouette and is equipped with a system for protecting the crew from the effects of mass destruction weapons.

The foreign press stresses, in evaluating the new vehicle, that its design has much in common with a number of known tanks, particularly the

West German "Leopard." In 1972 it is planned to put out a test series of 200 units.

The armed forces are also equipped with the "60" APC. This is a fully armored vehicle weighing 10 tons, with a combat compartment for transporting infantry (9 men), and with 7.62-mm and 12.7-mm machineguns.

Rearming of the Japanese Army is taking place to the accompaniment of revenge-seeking demands for revision of the Japanese constitution and for equipping the armed forces with nuclear weapons. The bigwigs of monopolies and the reactionary heads of militaristic circles, who receive colossal profits primarily at the expense of the Japanese taxpayer, are nurturing far-reaching expansionistic plans and are trying to convince the public of the country that only nuclear missile weaponry is capable of giving Japan international weight and transform it into a "first-rate power." However the overwhelming majority of the Japanese people refuses to follow the appeals of the frantic militarists. Broad circles of the populace are coming out more and more actively in defense of their right to a peaceful life, as fixed in the postwar constitution.

MEETING WITH READERS

Engr-Lt Col Ye. Pateyuk

To what degree do the materials published in this journal help the readers, and above all the engineers and technicians, in their everyday work? This question, which essentially defines the degree of effectiveness of the journal, was the center of attention of participants at a conference which took place in the Order of Lenin Red-Banner Kaliningrad Higher Military Engineer Command School imeni A. A. Zhdanov.

Engr-Col Ye. Karasev, who gave a detailed report, noted that in recent years the journal has begun to be not only better formatted, but of higher quality in published material. In particular, in Karasev's opinion, the articles are very current which reflect the achievements of native science and technology and which illuminate questions of operation of combat equipment under different conditions. Not only young officers and students, but also school instructors find much that is useful in articles published under the caption "Aggregates, assemblies, parts." The speaker stressed that many materials devoted to operation of armored and truck-tractor equipment are also of interest for specialists of engineer troops. In conclusion, he expressed a desire to publish more articles which generalize the practical experience of leading commanders and officers of the technical services who are engaged in operating and repairing combat equipment directly in the troop units.

Officers who took part in the discussion spoke of a need to devote more attention to questions of operating the varied and complex engineer equipment. In particular, Engr-Lt Col V. Sorokin noted that it is desirable to place articles on troop electrical power engineering in the journal. In developing this thought, Engr-Lt Col V. Rudnev made a suggestion to publish a cycle of articles devoted to work of the military power inspection service. He said that the school has set up a supernumerary group for supervision over power units, but its work immediately met organizational difficulties and certain problems of material support had not been resolved. It is evident that the troop units also have a need for explanations on these questions.

Practice shows that junior officers, graduates of military schools, who usually possess good specialized knowledge, do not always possess

sufficient methodological skill. In analyzing articles devoted to methodology of technical training published recently in the journal, Engr-Lt Col S. Kalashnikov criticized the insufficient concreteness and the striving by authors to give only general recommendations. One must write more, not about what to do, but on how to do it -- this is the basic thought of the above individual. He also spoke of the importance of materials devoted to problems of engineering psychology, and stressed their urgent need to be more concrete and directed toward a broad range of readers. Engr-Lt Col S. Kalashnikov said that more sketches and information is needed about the work of junior officers who recently finished school.

Engr-Maj Ye. Aleshechkin recommended the more frequent inclusion of materials about the work of deputy podrazdeleniye commanders for technical matters, about the procedures for preparing and turning in vehicles for repair, and about the use of organic repair means.

The officers also said much more and indicated more desires. It was valuable, in that all of them were imbued with concern for the journal, the importance of which is constantly rising, in the unanimous opinion of all participants.

In summing up results of the conference, the deputy chief of the school, Col S. Umanskiy, noted that the long, frank conversation reflected the genuine concern of the officers that propaganda of military-technical knowledge as performed by the journal steadily expand and become more effective. This to a great degree must be the result of the activeness of officer-instructors.

JOURNAL CONTENTS FOR 1971

EDITORIALS, PROPAGANDA ARTICLES, SKETCHES, REPORTS, ACHIEVEMENTS OF NATIVE SCIENCE

WEAPONS, EQUIPMENT, APPARATUS

TECHNICAL TRAINING, TRAINING FACILITIES

OPERATING COMBAT EQUIPMENT

INNOVATOR CREATIVITY

YOUR TECHNICAL HORIZONS

OUR FRIENDS

IN ARMIES OF CAPITALIST STATES

IN THE WORLD OF BOOKS

PUBLISHING HOUSES IN 1972

Voyenizdat

Anglo-Russkiy slovar' po aviatsionno-kosmicheskim materialam (Anglo-Russian Dictionary of Aerospace Materials). Compiled by Borisov, I. F.

The dictionary contains around 20,000 terms from the field of development, improvements, manufacture, testing, and employment of materials in designs of atmospheric and space apparatus, power plants, and missiles. It also includes terms on aviation and rocket fuels, lubricants, and hydraulic liquids.

Belayev, A. S. et al. Bor'ba s pozharami na ob"yektakh narodnogo khozyaystva v usloviyakh yadernogo porazheniya (Fighting Fires in National Economic Installations Under Conditions of Nuclear Destruction).

The book examines the destructive effects of light radiation and the shock force of a nuclear burst as causes of the outbreak of fires. It sets forth the methods of determining the possible fire situation of an installation and adjoining territory.

The book shows fire-fighting equipment at the disposal of fire-fighting formations.

Kalashnikov, A. M., Stepuk, Ya. V. Osnovy radiotekhniki i radiolokatsii. Kolebatel'nyye sistemy (Fundamentals of Radio Technology and Radar: Oscillating Systems).

The book describes oscillating circuits, lines of electromagnetic energy transmission, wave guides, cavity resonators, and antennas. Much attention is given to examination of the physical substance of the processes.

Knyazhitskiy, G. M. Osnovy elektrotekhniki (Fundamentals of Electrical Engineering).

A detailed examination of the fundamental laws of direct current, the electric field, capacitance, magnetic field and electromagnetic phenomena, alternating current, transformers and electrical machines, electrical

measurement instruments. It contains reference material needed for practical work.

Ostroukh, F. I. Stroitel'stvo bystrovozvodimykh ubezhishch i protiveradiatsionnykh ukrytiy (Construction of Quick-Erection Shelters and Antiradiation Shelters)

Generalization of experience of construction of protective structures in short time periods.

Examples given of such structures made of various materials, and design characteristics and recommendations on use of reinforced concrete parts.

Shpilev, K. M., Kruglov, A. B. Samolet i prirodno-klimaticheskiye usloviya (Aircraft and Natural Climatic Conditions).

Analysis of the influence of natural climatic conditions on the technical state and operation of contemporary aircraft, and features of storage and use of POLs and pressure fluids of hydraulic systems in zones with varying natural climatic conditions.

Komarovskiy, A. N. Zapiski stroitelya (Notes of a Builder).

Memoirs of Hero of Socialist Labor, Lenin and State Prize Laureate, Doctor of Technical Sciences, Professor, Col Gen Engr-Tech Serv A. N. Komarovskiy, encompassing 40 years of his work.

The author is a major engineer-builder. In prewar years under his leadership the largest hydrotechnical structures in the land were erected. During the Great Patriotic War Komarovskiy led the building of defensive lines, and then on assignment from the government he designed and constructed very important installations of the defense industry.

Transport

Bazov, D. I. Aerodinamika vertoletov (Aerodynamics of Helicopters).

Sets forth principles of helicopter flight and the characteristics and operation of the main rotor in modes of autorotation, axial and transverse flow-around; describes modes of vertical and horizontal flight of the helicopter, its stability, controllability, and action of aerodynamic forces during all this.

Kuznetsov, Ye. S. Tekhnicheskoye obsluzhivaniye i nadezhnost' avtomobilya (Motor Vehicle Maintenance and Reliability).

Provides a classification of the patterns of change in technical condition of a vehicle, of its aggregates and mechanisms. Examines methods of determining modes of technical maintenance and its rational technology. Generalizes native and foreign experience in the field of technical operation and reliability of vehicles.

Kuptsov, Yu. S. Uvelicheniye sroka sluzhby kontaktnogo provoda (Increasing Contact Wire Life).

Describes attributes of contact materials; cites results of analysis of wear of various types of wires when operating with plates of various materials: copper, steel, carbon-graphite metal-ceramic compounds. Examines various methods for extending the life of a contact wire and provides an evaluation of their economic effectiveness under concrete operating conditions.

Mashchenko, A. F., Rozanov, V. G. Tormoznyye sistemy avtotransportnykh sredstv (Braking Systems of Motor Vehicle Transport).

Examines features of design and operational-technical measures for maintaining a high effectiveness of brake mechanisms and controls of modern complex braking systems of vehicles and vehicle trains. Sets forth prospects for development of individual types of braking systems in light of demands of traffic safety and an increase in braking dynamics.

Sokolov, S. D. et al. Montazh, naladka i ekspluatatsiya poluprovodnikovykh preobrazovateley tyagovykh podstantsiy (Assembly, Adjustment, and Operation of Semiconductor Converters of Tractive Substations).

Cites characteristics and describes designs of semiconductor converters and systems of their forced and natural cooling; provides protection, signalling, and control circuit diagrams; examines the assembly, adjustment, and testing, operation, and repair of converters.

Smirnov, N. N., Mulkidzhanov, I. K. Ekspluatatsionnaya tekhnologichnost' transportnykh samoletov (Technological Effectiveness of Operation of Transport Aircraft)

Examines methods of maintaining and repairing aircraft. Provides an evaluation of the design-production decisions of individual assemblies and systems. Cites criteria and methods of evaluating technological effectiveness of operation of aircraft.

Sovetskoye radio

Burenin, N. I. Radiolokatsionnyye stantsii s sintezirovannoy antennoy (Radars With Synthetic Antenna)

Sets forth theory of coherent radars with lateral scanning designed for obtaining a detailed radar image of the earth's surface from flying apparatus. Examines various methods of obtaining artificial antenna opening and determines the extremes of this type of radar's capabilities in regard to resolution and detection of targets. Cites recommendations on choosing optimal parameters of radars which provide a maximum probability of target detection. Evaluates the capabilities of coherent side-looking radar with constant emission.

Zakharov, L. N., Lemanskiy, A. A. Rasseyaniye voln "chernymi" telami (Dispersion of Waves by "Black" Bodies).

Sets forth theory of dispersion of acoustic and electromagnetic waves by ideally absorbing "black" bodies. Examines known methods of calculating fields diffracting on a "black" body. Formulates a new method which permits obtaining the solution to a task of dispersion on a "black" body if the problem has been solved for a body with ideal conductivity. The proposed method is used for solving a number of concrete problems of radar and antenna technology. Discusses various physical models of a "black" body.

Kuz'min, F. I. Zadachi i metody optimizatsii pokazateley nadezhnosti (Problems and Methods of Optimizing Indicators of Reliability).

Examines characteristic problems of optimization of indicators of reliability at various stages, beginning from a grounding of the demands on reliability and including operation. Cites basically original solutions to problems of providing reliability which have not yet been reflected in the literature.

Levin, A. P. Kontakty elektricheskikh soyediniteley radioelektronnoy apparatury (Contacts of Electrical Connectors of a Radioelectronic Apparatus).

Examines the basic designs of contact pairs of electrical connections of radioelectronic apparatus of various purposes. Sets forth the basic demands on them, and methods of calculation and design.

Calculation of size of elastic elements is made according to methods generalizing the theory of accuracy and the theory of elasticity, with consideration for fatigue of materials.

Mayzel's, Ye. N., Torgovanov, V. A. Izmereniye kharakteristik rasseyaniya radiolokatsionnykh tseley (Measurement of Characteristics of Dispersion of Radar Targets).

A majority of characteristics of dispersion of complex radar targets are obtained by their measurement on ranges or in non-echo chambers.

The work sets forth methods of measurements, cites measurement units for determining characteristics of radar targets, and describes various types of modelling on UHF, coherent optical oscillations, and ultrasound. Much attention is given to analysis of measurement errors.

Maslov, A. Ya., Tatarskiy, V. Yu. Povysheniye nadezhnosti radioelektronnoy apparatury (Increasing the Reliability of Radioelectronic Apparatus)

Sets forth questions of reliability of radioelectronic apparatus with consideration for gradual changes in the parameters of its elements. Examines analytical and experimental methods of determining parameters of elements of typical stages (units) of the apparatus.

Suggests a number of examples which were worked in detail and checked experimentally. Describes in detail the principles of composing algorithms of universal programs of calculating parameters of elements from computers, methods and techniques of experimentally obtaining working fields.

Poluprovodnikovyye pribory i ikh primeneniye (Semiconductor Instruments and Their Use) Edited by Ya. A. Fedotov.

Cites new types of semiconductor instruments and their parameters and characteristics; methods of investigating attributes of semiconductor instruments and corresponding apparatus. Characterizes physical processes in these instruments which determine the capabilities of their use and reliability of operation. Examines methods of employing semiconductor instruments in various types of circuits, based on specific features of these instruments and distinguished from other known methods by higher results, a high reliability of operation, and mutual interchangeability of instruments.

Stepanov, S. V. Profilakticheskiye raboty i sroki ikh provedeniya (Preventive Work and When to Perform It)

Describes the influence of time of conducting preventive maintenance on the reliability and readiness of devices. Shows certain features of preventive maintenance on standby systems and devices which are in storage or on standby.

Tunik, A. T. Okhlazhdeniye radioelektronnoy apparatury zhidkimi dielektrikami (Cooling Radioelectronic Gear With Liquid Dielectrics).

Examines electrophysical attributes of fluoro-organic liquid dielectrics and cites evidence of the effectiveness of heat exchange on boiling of liquid dielectrics under conditions of free and forced movement. Gives values of critical density of heat currents. Sets forth thinking on capacities of dispersion and maximum allowable temperatures in elements of radioelectronic apparatus.

Shumopodobnyye signaly v sistemakh peredachi informatsii (Noiselike Signals in Information Transmission Systems). Ed. by V. B. Pestryakov.

Cites physical explanation of properties of noiselike signals and optimal schemes of their reception; examines physical processes in these schemes under the action of signals, interference, and a mixture. Gives a characteristic of signals which could be used in information transmission systems.

Main attention is given to the theory and practice of constructing apparatus, methods of eliminating misalignment of frequency and time mismatch (synchronization), practical realization of schemes, and determination of the quality of their operation when there is deviation in parameters and an instability of elements.

HYDROMECHANICAL HOIST

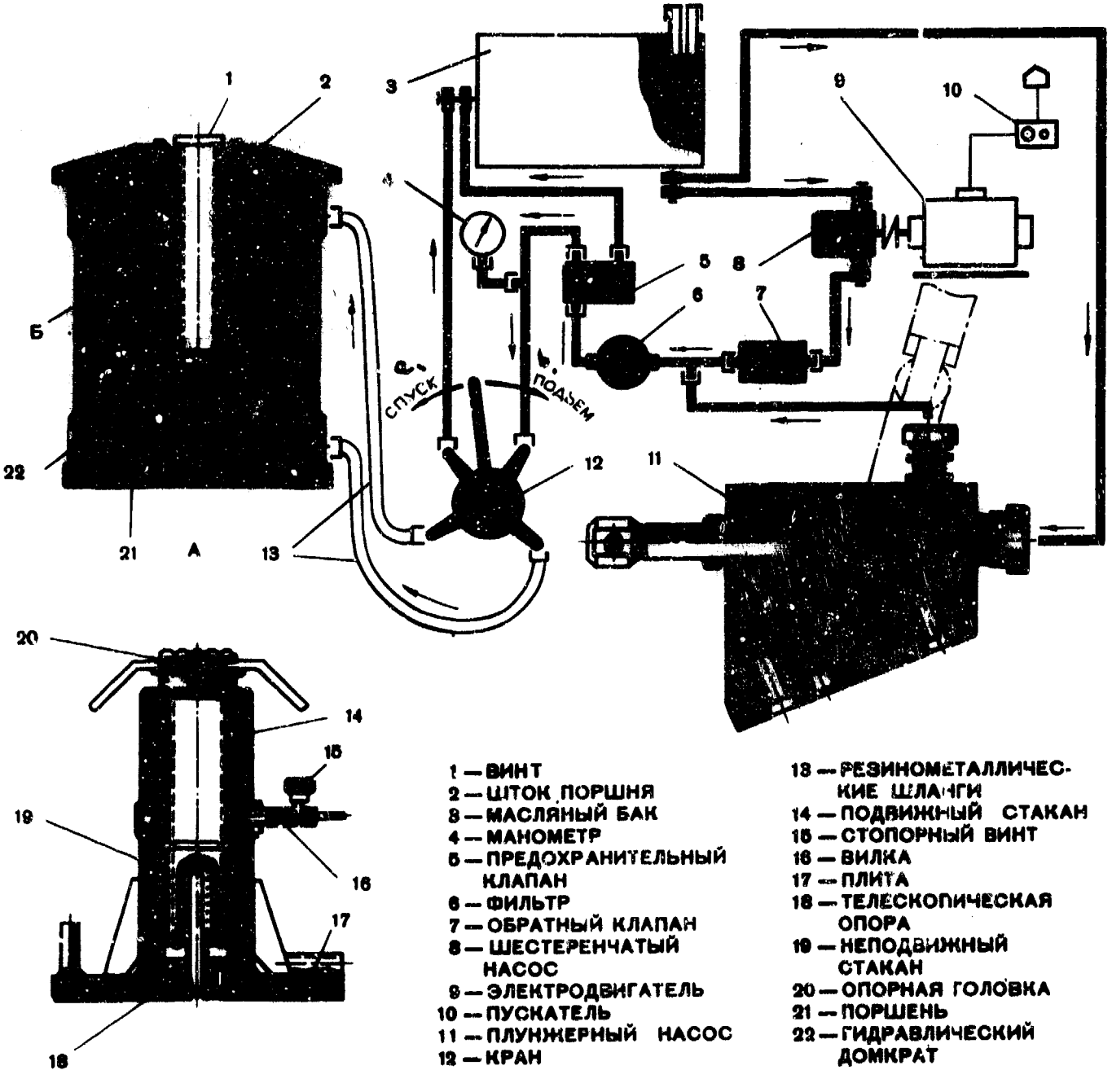
It is convenient to use a hydromechanical hoist to suspend tanks and other tracked vehicles during maintenance and repair in field and post conditions. The set includes a hydraulic jack with control mounted on a carriage, two support plates, on which two telescopic supports are mounted in turn, and a carriage to transport the plates. To suspend a tank, an even area is picked (with a slant not greater than 3 degrees). On it, and strictly along the line of the tank's longitudinal axis, are prepared two places which in winter are cleared of snow and ice, and sand is strewn about. Then using the carriage we set up the support plates. Their transverse axes must not deviate from the tank's longitudinal axis by more than 100 mm. If one plate is moved, let us say, to the right, then the other must be moved to the left by the same distance.

On one of the plates we place the jack (22) (see Figure). The electrical cable is hooked into a circuit which definitely must have an automatic protective device. After this the lever of the valve (12) is moved into the "hoist" position and the starter button (10) is pressed.

When the electric motor (9) begins to operate, the gear pump (8) sends pressure fluid (oil) into cavity A of hydraulic jack (22) through the reverse valve (7), filter (6), safety valve (5), and rubber-metal hose (13). The pressure set up acts against the lower surface of piston (21). As a result, it and its rod (2) rise, suspending the tank.

In case there is no electrical power, we can use the manual plunger pump (11).

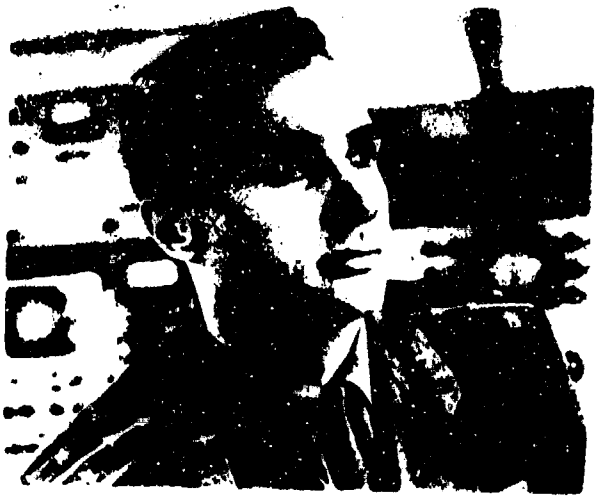
As soon as the piston rod reaches maximum height, the electric motor is turned off. Then we unscrew the telescopic support screws on this plate until their support heads (19) reach the tank bottom. The screws are stopped by yoke (16). We note that a wooden liner should be placed between the tank bottom and the support head. After seeing that the liners are well pressed, valve (12) is placed in "down" position and again the electric motor is turned on. Under the effect of the pressure fluid, which this time goes to cavity B, the rod descends and the tank bottom rests on the support heads.



1 — ВИНТ
2 — ШТОК ПОРШНЯ
3 — МАСЛЯНЫЙ БАК
4 — МАНОМЕТР
5 — ПРЕДОХРАНИТЕЛЬНЫЙ КЛАПАН
6 — ФИЛЬТР
7 — ОБРАТНЫЙ КЛАПАН
8 — ШЕСТЕРЕНЧАТЫЙ НАСОС
9 — ЭЛЕКТРОДВИГАТЕЛЬ
10 — ПУСКАТЕЛЬ
11 — ПЛУНЖЕРНЫЙ НАСОС
12 — КРАН
13 — РЕЗИНОМЕТАЛЛИЧЕСКИЕ ШЛАНГИ
14 — ПОДВИЖНЫЙ СТАКАН
15 — СТОПОРНЫЙ ВИНТ
16 — ВИЛКА
17 — ПЛИТА
18 — ТЕЛЕСКОПИЧЕСКАЯ ОПОРА
19 — НЕПОДВИЖНЫЙ СТАКАН
20 — ОПОРНАЯ ГОЛОВКА
21 — ПОРШЕНЬ
22 — ГИДРАВЛИЧЕСКИЙ ДОМКРАТ

KEY: 1 -- screw; 2 -- piston rod; 3 -- oil tank; 4 -- manometer; 5 -- safety valve; 6 -- filter; 7 -- reverse valve; 8 -- gear pump; 9 -- electric motor; 10 -- starter; 11 -- plunger pump; 12 -- valve; 13 -- rubber-metal hoses; 14 -- movable sleeve; 15 -- stop screw; 16 -- fork; 17 -- plate; 18 -- telescopic support; 19 -- fixed sleeve; 20 -- support head; 21 -- piston; 22 -- hydraulic jack; a -- down; b -- up.

IN MILITARY DISTRICTS, GROUPS OF FORCES, AND FLEETS



Order of Lenin Moscow PVO District

Chief of an excellent group of routine maintenance personnel, specialist 1st class Engr-Capt Yu. Dalanov, enjoys the deserved authority among personnel of an air regiment. A well trained officer, he generously shares his experience and knowledge with his comrades in the service, who are engineers and technicians.

Order of Lenin Leningrad Military District

Technical creativity is a long-time hobby of the commander of an excellent sapper training podrazdeleniye, Gds Maj V. Kolobayev. He has on his account over 20 innovative suggestions. Among them is a control and communications panel for the chast' duty officer, a device for charging storage batteries, and many different training aids.

The officer not only engages in innovative work himself, but brings in his subordinates as well. The podrazdeleniye group of innovators was noted as best at a district exhibition of technical creativity.

Order of Lenin Moscow Military District

Deputy Podrazdeleniye Commander Engr-Capt A. Kurdyukov is an excellent methodologist. He conducts each class in a way that aids in a steady increase in knowledge and skills on the part of personnel. The officer gives special attention to field training of his subordinates.

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V. Sosedov and Sr Lt Yu. Mal'tsev. Some of these methods are formulated as innovative proposals and adopted in other podrazdeleniye.

TECHNOLOGY AND ARMAMENT-TRANSLATION

ARMY

C459 COMD-GEN STF COL
C461 INFANTRY SCH
C470 ARMY WAR COL
C545 CMBT DEVLP COMD
C557 USAIIC
C620 USASRD
C768 OACSI-USAITAD
C788 OACSI-SOV/EEUR DIV
C072 CDC CONFOR GP
C532 MEWTA-EL WARLABS

NAVY

D159 NAVAIRDEVCEN

AIR FORCE

E018 AF/RDQLR-SAMSO
E408 AFWL
E411 ASD
E420 FRD(3)
E429 SAMSO (IND)

UNIFIED & SPECIFIED COMMANDS

H101 USAFE 497RTG (IRC)
H300 USAICE (USAREUR)
H500 CINCUSNAVEUR

K100 PACAF (2)

L040 SAC 544TH ARTW (2)

ARMY MATERIAL COMMAND

C509 ABERDEEN R&D CTR (8)
C514 FRANKFORD ARSENAL
C517 WATERVLIET ARSENAL
C519 MUNITIONS CMD
C535 AVIATION SYS COMD
C538 WHITE SANDS MSL RG
C560 AVIATION MAT LAB
C590 TANK AUTOMOT COMD
C619 MIA REDSTONE (5)
C697 ABERDEEN PRV GRD
AMCRD-I
AMCRD-T
STEAP-TL
AMXST-OC
AMXST-IS3 (25)
AMXST-ST1
AMXST-ST2
AMXST-ST3
AMXST-GE
AMXST-SR
AMXST-SD
AMXST-TD
AMXST-SR
AMXST-CE
AMXST-CB (2)
AMXAM

OTHERS

DDC-IR (12)
CIA/CTS
S030 FRD LIB OF CONG
DIA/DS-4C (44)